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tiorari to October 3, 1971. The jurisdiction of this Court is invoked under 28 U.S.C. 1256. *Brenner* v. *Manson*, 383 U.S. 519.

QUESTION PRESENTED

Whether a method of converting numerical information from binary coded decimal numbers into true binary numbers, for use as an operational program in conventional general-purpose digital computers, is patentable.

CONSTITUTIONAL AND STATUTORY PROVISIONS INVOLVED

Article I, Section 8, clause 8, of the Constitution of the United States provides:

> The Congress shall have Power * * *
>
> * * * * *
>
> To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries;

35 U.S.C. (1964 ed.) 100(b) provides:

> The term 'process' means process, art or method, and includes a new use of a known process, machine, manufacture, composition of matter, or material.

35 U.S.C. (1964 ed.) 101 provides:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

STATEMENT

The issue in this case is whether respondents are entitled to a patent on a method which they have claimed for programming a general purpose digital computer. A digital computer operates essentially by choosing between two alternatives. The necessary choices are made by the opening and closing of electric switches, by varying voltages or currents in circuits, or by other electronic methods. The process is controlled by arranging a system of signals, in the proper sequence, in a form compatible with the computer's characteristics, for example, by recording them on punched cards or magnetic tapes. The arrangement of signals is the "program," "a sequence of coded instructions for a digital computer" (Webster's Third New International Dictionary). Programs are ordinarily recorded or "coded" by means of the binary number system, a method of numerical representation using only two digits—"0" and "1". The binary number system is used because the two symbols may be readily correlated with the electronic choice between two alternatives.

The respondents seek a patent on a method of converting "signals" or "numerical representations" from binary coded decimal form into binary form. A brief description of the binary number system will be helpful in describing their claim.

Decimal notations are commonly used to indicate numerical representations. The decimal system uses

the digits 1, 2, 3, 4, 5, 6, 7, 8, 9 and 0, arranged so that the numerical value of any digit depends on its position in the number. The positional values increase in sequentially ascending powers of 10 from right to left. Thus decimal numbers are written by placing digits in the appropriate column, *i.e.*, "units," "tens" (10^1), "hundreds" (10^2), "thousands" (10^3), etc.

The binary notation system could be described as the way man might count if he had only two fingers. Its two digits, "1" and "0", are placed in positions with values based on sequentially ascending powers of 2 which increase from right to left just as the place values of decimal numbers increase in sequential powers of 10. When "1" fills a position it symbolizes 2 to the power for that position; when "0" fills it, the position has no value. The place to the right of the position for 2^1 is used to distinguish between odd and even numbers. When this place is filled with "1" the combination of digits describes an odd number; when it is filled with "0" it describes an even number.

All numbers between 1 and 10 can be described in the binary system with four positions. Thus the following table can be compiled:

Decimal		Factored as Power of 2		Binary
0	=	0	=	0000
1	=	$0+1$	=	0001
2	=	2^1	=	0010
3	=	$2+1$	=	0011
4	=	2^2	=	0100
5	=	$2+1$	=	0101
6	=	$2+2^1$	=	0110
7	=	$2+2+1$	=	0111
8	=	2^3	=	1000
9	=	$2+1$	=	1001
10	=	$2+2^1$	=	1010

Decimal numbers can be written in binary decimal form by converting each component digit in its decimal position to a four-digit binary number. In this form they are called binary coded decimals (BCD). The value of each four-digit BCD number depends on its decimal position. Thus BCD numbers are a hybrid between the decimal and binary systems. For example, 53 in BCD is 0101 0011 because 5 equals $2^2+1=0101$, and 3 equals $2^1+1=0011$. In true binary form, however, in which decimal place values are not used, 53 equals $2^5+2^4+0+2^2+0+1=110101$.

For some computer operations it is necessary to convert from the binary coded decimal system to the true binary system. The method for doing this is what respondents claim in their patent application. Claims 8 and 13 of their application are the only claims in issue here.[1]

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[1] Claim 8 reads:

"The method of converting signals from binary coded decimal form into binary which comprises the steps of—

(1) storing the binary coded decimal signals in a reentrant shift register,

(2) shifting the signals to the right by at least three places, until there is a binary "1" in the second position of said register,

(3) masking out said binary "1" in said second position of said register,

(4) adding a binary "1" to the first position of said register,

(5) shifting the signals to the left by two positions,

(6) adding a "1" to said first position, and

(7) shifting the signals to the right by at least three positions in preparation for a succeeding binary "1" in the second position of said register."

Claim 13 reads:

"A data processing method for converting binary coded

The conversion of binary coded decimal numbers can be accomplished by a series of conventional mental steps through the use of a chart showing binary equivalents of decimal binary numbers between 1 and 10 (see chart on p. 4, *supra*), and by the mathematical processes of addition and multiplication (see App. C, *infra*, pp. 33–35). The respondent applicants vary the conventional steps by changing the order in which they are accomplished and the multiplier used in some steps, and by using sub-totals after each successive operation. No new machinery or hardware is necessary to complete the series of logical steps described. The mathematical procedures recited in their claims can be carried out in existing computer inventions used before the respondents' procedure was calculated; they can also be performed without a com-

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decimal number representations into binary number representations comprising the steps of—

(1) testing each binary digit position *i*, beginning with the least significant binary digit position, of the most significant decimal digit representation for a binary "0" or a binary "1";

(2) if a binary "0" is detected, repeating step (1) for the next least significant binary digit position of said most significant decimal digit representation;

(3) if a binary "1" is detected, adding a binary "1" at the (i+1)th and (i+3)th least significant binary digit positions of the next lesser significant decimal digit representation, and repeating step (1) for the next least significant binary digit position of said most significant decimal digit representation;

(4) upon exhausting the binary digit positions of said most significant decimal digit representation, repeating steps (1) through (3) for the next lesser significant decimal digit representation as modified by the previous execution of steps (1) through (3); and

(5) repeating steps (1) through (4) until the second least significant decimal digit representation has been so processed."

puter as the respondents showed before the Patent Office (see appendix C, *infra*, pp. 33–35).

The Patent Office examiner rejected claims 8 and 13 as unpatentable subject matter under 35 U.S.C. 101 on the ground that the computer program described in the claims, essentially a series of mathematical calculations or mental steps, was not a "process" within the statutory definitions of 35 U.S.C. 100(b). The Patent Office Board of Appeals affirmed the examiner's decision.

The Court of Customs and Patent Appeals reversed, holding that the computer program described in the claims qualified as a process within the statutory definition (App. A, *infra*). Citing with approval a dictum contained in one of its own recent decisions to the effect that "in reality very little remains * * * of the 'mental steps' doctrine," the court noted that even though the "workstuff of the method is numbers which are mathematical abstractions," the processes in question would almost certainly be implemented by machines; therefore, the court reasoned, the processes were really within the "technological" or useful arts. App. A, *infra*, pp. 27–31.

REASONS FOR GRANTING THE WRIT

The decision of the Court of Customs and Patent Appeals in this case effectively rules for the first time that a method of data processing which can be performed by a general purpose digital computer constitutes patentable subject matter, and raises over the still developing computer software field the threat

that general use of mathematical procedures involved in computer programming may become foreclosed by patent monopolies. The decision conflicts with rulings of this Court and of the courts of appeals that mathematical theories and mental steps are not patentable; it will have great impact on the computer industry and thus on the economy at large; and it presents extremely serious administrative problems for the Patent Office. To await infringement litigation to test the validity of patents on computer programs would create serious and costly uncertainty in the computer industry and the Patent Office. Certiorari should be granted now to resolve the important question raised by the decision below.

1. As shown in the statement, *supra*, and in Appendix C, *infra*, the "process" involved here is nothing more than an arrangement of arithmetical calculations, analogous, for example, to the conversion of Roman into Arabic numerals. In effect, respondents' application merely claims a procedure for applying familiar mathematical steps and principles to solve the problem of converting decimal numbers into the binary numbers used in digital computers. This is not the kind of "Discovery" contemplated either by the patent clause of the Constitution or by Section 101 of the Patent Code.

The underlying rationale of the limitations on patentability contained in these provisions is that ideas—scientific principles, mental processes, and abstract intellectual concepts—are the basic instruments of scientific and technological development, and, their free exchange is not to be hindered by the

granting of patent monopolies. (See the selections from letters of Thomas Jefferson quoted in *Graham* v. *John Deere Co.*, 383 U.S. 1, 8, n 2.) The binomial theorem or La Place's equations, even though the product of great intellectual effort, would not be patentable. The patent system is, instead, directed to the pragmatic application of such concepts to matter in new and useful ways. *Brenner* v. *Manson*, 383 U.S. 519. What is patentable is the application of abstract concepts to material inventions. If the concepts themselves or combinations of them were subject to the patent monopoly, scientific and technological creations could become stultified, because the very ideas which constitute the currency of intellectual development and exchange would be foreclosed.

This Court has repeatedly ruled that a scientific principle, rule, formula or mathematical expression is not a patentable process, regardless of the novelty or importance of the discovery. *Le Roy* v. *Tatham*, 14 How. 156, 174; *Mackay Radio & Telegraph Co.* v. *Radio Corporation of America*, 306 U.S. 86, 94; see also *O'Reilly* v. *Morse*, 15 How. 62; *Tilghman* v. *Proctor*, 102 U.S. 707; *Risdon Iron and Locomotive Works* v. *Medart*, 158 U.S. 68. Cf. *Burr* v. *Duryee*, 1 Wall. 531, 570; *Fuller* v. *Yentzer*, 94 U.S. 288; *Baker* v. *Selden*, 101 U.S. 99, 103. Although the court below emphasized that the methods involved in respondents' claims would almost certainly be implemented by computers, and thus did not explicitly reject the reasoning of these decisions, the court rec-

ognized that, in *fact*, "[t]he claims in this case are directed solely to the art of data processing itself" (App. A, *infra*, p. 25), and no subsidiary or additional art is necessary to implement the methods claimed. Indeed, as the court recognized, the processes involved in a computer program, including those claimed here, can be implemented with any kind of equipment which enables one to convert binary code decimal representations into binary number representations. As the court noted, "This could *in theory* be any kind of writing or even, we suppose, red and blue poker chips and a surface to put them on or slots to put them in so that 0's and 1's can be represented." App. A, *infra*, p. 30. We submit that the decision of the Court below makes no viable distinction between the subject of respondents' claims and pure mental processes, and is thus inconsistent with the cited decisions of this Court.

The instant case appears to be the last of a series of decisions by which the Court of Customs and Patent Appeals has eroded the long standing administrative and judicial doctrine, previously accepted by that court, that "purely mental steps do not form a process which falls within the scope of patentability as defined by statute." *Application of Shao Wen Yuan*, 188 F. 2d 377, 380 (C.C.P.A.).

The term "process" as used in Section 101 of the Patent Code, and as interpreted by the Patent Office, reflects the concepts articulated in this Court's decision in *Cochrane* v. *Deener*, 94 U.S. 780,

788,' and ultimately the concept of "discoveries" to which the patent clause of the Constitution applies. Cf. *Brenner* v. *Manson*, 383 U.S. 519, 534; *Graham* v. *John Deere Co.*, 383 U.S. 1, 5–6. In *Application of Musgrave*, 431 F. 2d 882, the Court of Customs and Patent Appeals suggested that decisions of this Court subsequent to *Cochrane* (see *Application of Prater and Wei*, 415 F. 2d 1378 (C.C.P.A.)) had altered the standards set forth in *Cochrane*. The court held in *Musgrave* that a process is patentable if it is in the "technological arts." Subsequently in *Application of Foster*, 438 F. 2d 1011, 1015, the court below ruled that "[I]t is not important whether the claims contain mental steps or not if the process is within the technological arts." The instant case completes this trend by awarding patents for the mental and mathematical calculations involved in computer programming.

The decision below also conflicts with the decision of the Ninth Circuit in *Don Lee, Inc.* v. *Walker*, 61 F. 2d 58, in which the court held unpatentable a method of counterbalancing engine main shafts which

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'*Cochrane* v. *Deener* defines a patentable process as follows (94 U.S. at 788):

> • • • A process is a mode of treatment of certain materials to produce a given result. It is an act, or a series of acts, performed upon the subject-matter to be transformed and reduced to a different state or thing. If new and useful, it is just as patentable as is a piece of machinery. In the language of the patent law, it is an art. The machinery pointed out as suitable to perform the process may or may not be new or patentable; whilst the process itself may be altogether new, and produce an entirely new result. The process requires that certain things should be done with certain substances, and in a certain order; but the tools to be used in doing this may be of secondary consequence.

it characterized as "a mathematical formula for the solution of a problem in dynamics." 61 F. 2d at 59. Similarly, in *Halliburton Oil Well Cementing Co.* v. *Walker*, 146 F. 2d 817, the Ninth Circuit struck down a claim on a method for locating an obstruction in a well on the ground that the method amounted to no more than a process for "setting down three knowns in a simple equation and from them determining or computing an unknown." 146 F. 2d at 821. In both of these cases, as here, the mental and mathematical processes were clearly intended to be implemented by machinery. The reliance of the court below on this factor does not reconcile its decision with those of the Ninth Circuit and with the cited rulings of this Court.[1]

2. The decision below, if allowed to stand, will have a serious impact upon the computer industry. The pat-

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[1] The Canadian Patent Office has instructed its Patent Examiners that computer programs are not patentable under Section 2(d) of the Canadian Patent Act:

"It [a patent] must not be for a computer programme, an algorithm, or a set of instructions to operate a computer. Similarly it may not be for a known or general purpose computer programmed in a particular way to produce a particular result. Under this criteria [sic] software such as punched cards or tapes carrying programmes and some hardware would be excluded. It is considered that the development of computer programmes falls within the expected skill of competent programmers, and as such lacks the requirement of non-obviousness. Furthermore, programmes in whatever form they may be presented, are essentially mathematical information developed from an algorithm and set forth in the form of a set of instructions. As such they are not allowable under Section 2(d)." The

Patent and Trademark Institute of Canada, Newsletter #36, August 9, 1971.

entability *vel non* of programming vitally affects a technology which permeates the economy and which involves great financial investment. Use of general purpose digital computers is increasing rapidly;[4] in 1969 there were more than 65,000 computer installations in the United States; at present there are approximately 250,000 active computer programs.[5] It is estimated that the annual cost of "programming" or "software" equals 30 percent of the purchase value of the trade inventory.[6] This may amount to $15 billion

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[4] Encyclopaedia Britannica (1970 ed.), Vol. 12, p. 244B, states under "Information Processing * * * 4. Computer Industry," that:

> The original purchase price of the 62,000 general-purpose digital computers manufactured by the United States companies during the decade ending in 1967 totalled more than $20,000,000,000, including $6,000,000,000 for those made in 1967 alone. * * * If the trend continued, by the mid-1970s there would be 200,000 U.S.-manufactured computers in use throughout the world, originally costing a total of $100,000,000,000 with about half the total number and total value at installations in the U.S.

[5] Reports on the DP [Data processing] Industry, DP Focus, August 1970, at 274; Communications of the ACM [Association for Computing Machinery], Vol. 14, No. 3, at 201 (March, 1971), reprinting statement made by Walter Carlson, President of ACM at hearing conducted by the U.S. Department of Labor, Wages and Hours Division.

[6] "Annual operating costs for computing systems ('hardware') include maintenance costs and the amortized purchase price, typically on a 3–4 year useful life basis, commonly called the hardware cost. About an equal amount is required to cover 'software' costs—software refers to the many kinds of computer programs required for computer systems, each program also

(Footnote contd. top of p. 14)

with a short useful life. Hardware and software costs, taken together, total annually about 60% of the purchase value of the hardware inventory." Encyclopaedia Britannica (1970 ed.), Vol. 12, p. 244B.

for installations in the United States by the middle of this decade. To protect themselves from the legal uncertainties created by this decision, software firms will have to undertake the expense of acquiring patents and licenses. Even if these steps are taken, it will be virtually impossible to dispel the threat of infringement litigation. Since virtually all users of computers prepare some of their own programs, the class of persons adversely affected by this decision, including both programmers and users, will be very large.

The decision below could also produce enormous problems in the administration of the patent program. The 1966 Report of the President's Commission on Patent System (reprinted in S. Doc. No. 5, 90th Cong., 1st Sess., p. 21) recommended that computer programs not be patented,[7] in part because it is questionable whether an effective system for the examination of computer programs can be developed. No adequate classification, technique or research files exist, and, as the Commission observed, "Even if these were available, reliable searches would not be feasible or economic because of the tremendous volume of prior art being generated" (*ibid.*). For this reason, it is doubtful that the criteria for examination of patent

[7] Legislation to implement this recommendation was introduced in the patent revision bill embodying the report's proposals. See Section 106, S. 1042, 90th Cong. 1st Sess. However, the proposal is not contained in the current patent revision bill, S. 643, 92d Cong., 1st Sess.

applications required by *Graham* v. *John Deere, supra,* 383 U.S. at 18–19, can be effectively applied to applications for patents on computer programs. Rather, under the instant decision, patents issued on such applications may be little more in fact than registrations, which must await the test of infringement litigation. As stated in *Graham* v. *John Deere, supra,* "[t]o await litigation is—for all practical purposes—to debilitate the patent system", 383 U.S. at 18. The question of the patentability of computer programs should be definitely resolved now.

CONCLUSION.

For the foregoing reasons, the petition for a writ of certiorari should be granted.

Respectfully submitted.

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OCTOBER 1971.

445-688—71——3

APPENDIX A

United States Court of Customs and Patent Appeals
(October Term, 1970; Patent Appeal No. 8376; Serial No. 315,050)

IN THE MATTER OF THE APPLICATION OF
GARY R. BENSON AND ARTHUR C. TABBOT
May 6, 1971

RICH, Judge.

This appeal is from the January 31, 1968 decision of the Patent Office Board of Appeals[1] affirming the rejection of claims 8 and 13, the only claims remaining in appellants' application serial No. 315,050, filed October 9, 1963, and assigned to Bell Telephone Laboratories Incorporated, entitled "Conversion of Numerical Information." We reverse.

THE INVENTION

The invention of the appealed claims is in the field of computer technology and relates to data processing systems. The claims are both directed to methods. The opening sentence of the specification states that the invention relates to the processing of data by program and more particularly to the programmed conversion of numerical information. The particular conversion to which both of the claims on appeal are directed is the conversion of "binary coded decimal" (BCD) numerical information in the form of "signals" (claim 8) or "representations" (claim 13) into binary number signals or representations, respectively. Though we

[1] Consisting of Kreek, Keely, and Andrews, Examiners-in-Chief, opinion by Andrews.

presume this statement would be an adequate explanation to those skilled in the computer art, for the benefit of those not so skilled we will elucidate further.

Most ditigal computers perform their computing operations on information in binary form, a system of representation having only two elementary constituents, called "bits," indicated by "1" and "0". Men, on the other hand, are accustomed to quantitative information in decimal form and, for the computer to work on or utilize it, it must be converted into binary form. It has become a general practice to make this conversion in two stages: from decimal to BCD; from BCD to binary. The following table shows the ten familiar decimal digits and their binary equivalents expressed in groups of four bits:

Decimal:	*Binary*
0	0000
1	0001
2	0010
3	0011
4	0100
5	0101
6	0110
7	0111
8	1000
9	1001

In BCD notation the decimal number 53 would be represented as 0101, 0011, the binary form of 5 followed by the binary form of 3, each group of four bits being a BCD "digit." Although the BCD notation is in terms of "1" and "0" only and can be represented in a binary machine, it is not in a form in which the machine can utilize it to perform its computing operations. In true binary the decimal number 53 is represented by 110101. The problem is to convert the intermediate BCD representation into the true binary. Various ways of doing this were known prior to appellants' invention. They claim to have

discovered a better and simpler way of doing it having various advantages recited in the specification such as reducing the number of steps required to be taken, dispensing with the repetitive storing and retrieval of partially converted information, eliminating the need for interchanging signals among various equipment components and the need for auxiliary equipment, and decreasing the chance of error.

The digital computer which is to receive the information in BCD form can itself be programmed to convert it into binary form. The specification gives as an illustrative example an actual program for converting a binary-coded decimal number to ordinary binary and apparatus is described in conventional block diagram form in which the program can be carried out.

The two claims on appeal read as follows:

> 8. The method of converting signals from binary coded decimal form into binary which comprises the steps of
>
> (1) storing the binary coded decimal signals in a reentrant shift register,
>
> (2) shifting the signals to the right by at least three places, until there is a binary "1" in the second position of said register,
>
> (3) masking out said binary "1" in said second position of said register,
>
> (4) adding a binary "1" to the first position of said register,
>
> (5) shifting the signals to the left by two positions,
>
> (6) adding a "1" to said first position, and
>
> (7) shifting the signals to the right by at least three positions in preparation for a succeeding binary "1" in the second position of said register.
>
> 13. A data processing method for converting binary coded decimal number representations

into binary number representations comprising the steps of

(1) testing each binary digit position *i*, beginning with the least significant binary digit position, of the most significant decimal digit representation for a binary "0" or a binary "1";

(2) if a binary "0" is detected, repeating step (1) for the next least significant binary digit position of said most significant decimal digit representation;

(3) if a binary "1" is detected, adding a binary "1" at the (i+1)th and (i+3)th least significant binary digit positions of the next lesser significant decimal digit representation, and repeating step (1) for the next least significant binary digit position of said most significant decimal digit representation;

(4) upon exhausting the binary digit positions of said most significant decimal digit representation, repeating steps (1) through (3) for the next lesser significant decimal digit representation as modified by the previous execution of steps (1) through (3); and

(5) repeating steps (1) through (4) until the second least significant decimal digit representation has been so processed.

As to these claims, no prior art is cited and no question is raised as to utility, novelty, or unobviousness. The asserted advantages and the implicit advance resulting therefrom in the data-processing art have not been questioned.

THE REJECTION

The first problem it is necessary to settle is what the ground or grounds of rejection is or are. Appel-

lants' brief correctly states, "The only explicit rejection outstanding against claims 8 and 13 is the rejection on the grounds [sic] that these claims are directed to subject matter not embraced by Section 101." Study of the two Examiners' Answers makes it clear that that was the only ground he relied on. In his first Answer the Examiner specified that "all grounds of rejection are withdrawn *except* the art rejections and nonstatutory subject matter rejections." We no longer have any art rejections. In his second Answer, on remand, he said:

> In summary, the remaining ground of rejection of claims 8 and 13 now in the case is that these claims are directed to non-statutory subject matter.

In reciting what the rejection was, the board opinion says:

> Claims 8 and 13 stand rejected as for subject matter not embraced by 35 U.S.C. 101 in that they set forth "mental processes" and "mathematical steps," neither being an "art" as construed by a long line of decisions * * *.

Nowhere does the board opinion indicate that any new ground of rejection is being made.

In discussing appellants' arguments traversing the contention that the claims are directed to non-statutory subject matter, the board, answering the argument that "The only way applicants' claims can be construed to include mental steps is to construe them contrary to the disclosure rather than in accord therewith," made the following somewhat off-the-point observations:

> We are not convinced by appellants' arguments to the effect that the disclosure in an application, not the claims thereof, should be the proper basis for judging whether the claims

> are drawn to subject matter outside the statute. Certainly a claim which embraces that which was already in the prior art or was obvious therefrom could not be sustained under 35 U.S.C. 102 or 103 merely because there may have been something patentable disclosed in the specification. *35 U.S.C. 112* [2d par., 1st sentence] *requires the claim to point out the subject matter which the applicant regards as his invention so that a claim which is so broad and indistinct as to embrace within its terms subject matter that can not be patented under section 101 of the statute, similarly must be unpatentable.* [Emphasis ours.]

While from that point on in its opinion the board discussed the breadth of the claims and what in its opinion they cover, it never so much as suggested that the claims are "indistinct" or do not point out "the subject matter which the applicant regards as his invention." The board did not again refer to section 112 nor in any way suggest failure of the claims to comply with the second paragraph of that section and merely affirmed the rejection on the ground that the claims, as it read them, were directed to methods which are non-statutory under section 101. It is our opinion that up until the time of the appeal to this court there was only one ground of rejection relied on and that was non-compliance with section 101.

However, apparently out of an abundance of caution and noting the board's reference to section 112 in the above-quoted passage, as well as a similar passage in the Examiner's Answer on Remand,[1] appel-

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[1] Continuing the statement quoted above as the first quotation in this section, the examiner said:

> The method set forth is by applicants' own assertion "directed to a machine algorithm"; and as understood recites

lants' main brief, toward its end, says of the italicized passage in the above quotation from the board's opinion that it could be construed as another example similar to the sections 102 and 103 example preceding, *or it could also be construed as an entirely new ground of rejection under section 112*, simultaneously deploring the "vagaries of prosecution [which] leave some of the basic issues in doubt." Appellants thereupon spent a page of their brief stating their reasons why a rejection under the second paragraph of section 112, *if* such had been made, would be in error. That would seem a cautious thing to do but it does not bring such a rejection into the case unless it was already there.

The brief for the Patent Office trades heavily on this situation. On page 2 it quotes appellants as saying that they "have no alternative but to consider a rejection under Section 112 as having been raised and requiring a response" and proceeds to the conclusion that "A rejection under 35 U.S.C. 112, 2nd paragraph, would thus also appear to [be] present," pointing out that a reason of appeal in appellants' Notice of Appeal alleges that the board erred

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a series of steps for manipulation of data required to be carried out by a programmed computer. Such a method, set forth in this manner, is not considered to properly set forth a process within the meaning of 35 USC 101, in light of prior decisions and the requirements of 35 USC 112. The subject matter of the claims is thus deemed non-statutory.

That paragraph by the examiner therefore begins and ends with the summary statement of his position that *the* single ground of rejection is that the claims are directed to non-statutory subject matter under 35 USC 101. In short, a method carried out by a programmed computer is non-statutory. His reference to section 112 is not clear as to its purpose and seems superfluous.

> * * * in sustaining the Examiner's rejection of claims 8 and 13 as failing to point out the subject matter which appellants regard as their invention under 35 U.S.C. 112 in that the claims are so broad and indistinct as to embrace within their terms subject matter that can not be patented under 35 U.S.C. 101.

This, it will be seen, is a close paraphrase of what the board said in the paragraph quoted above. It was an appropriate reason of appeal to file to cover the contingency that what the board said might be a new ground of rejection. The Patent Office brief goes on to argue, it would seem as its *principal* contention,[4] not that the claims are directed to non-statutory subject matter because directed to mental or mathematical steps, which do not constitute an "art,"[5] *but* that "the rejection under 35 U.S.C. 112 should be affirmed" because appellants admitted during prosecution that their process is capable of manual implementation with the aid of pencil and paper, that this is "beyond that which they presently regard as their invention," and that the claims must be rejected *under section 112* by reason of our decision in *In re Prater and Wei*, 56 CCPA 1381, 415 F. 2d 1393, 162 USPQ 541 (1969).

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[4] More than 5 of the 7 pages of argument are devoted to this point. The brief begins by stating, however, that

> The principal rejection, of course, is that "[c]laims 8 and 13 stand rejected as for subject matter not embraced by 35 U.S.C. 101 in that they set forth 'mental processes' and 'mathematical steps,' neither being an 'art' . . ."

[5] The term "art," of course, is the term used in the statutes prior to 1953, the term now being "process" (35 USC 101) which is defined to include "art or method" (35 USC 100(b)). The board used the term "art" because it was referring to a number of pre-1953 cases which dealt with the meaning of that term in R.S. 4886, old Title 35 USC, section 31.

We have decided a number of cases in the general field of computer science in addition to the *Prater* case, supra, since the briefs in this case were filed which we list here for convenient reference:

In re Bernhart, 57 CCPA 737, 417 F. 2d 1395, 163 USPQ 611 (1969).

In re Mahony, 57 CCPA 939, 421 F. 2d 742, 164 USPQ 572 (1970).

In re Musgrave, 57 CCPA 1352, 431 F. 2d 882, 167 USPQ 280 (1970).

In re Foster, 58 CCPA ——, — F. 2d —, 169 USPQ 99 (1971).

This is an appropriate place to point out a significant difference between most of those cases and the present case. The claims in this case are directed solely to the art of data-processing itself whereas in most of the above cases some subsidiary or additional art was involved. In *Bernhart* it was "Planar Illustration Method and Apparatus" by which two-dimensional illustrations of three-dimensional objects could be produced; in *Mahony* we were concerned with data-processing itself in that the invention was a method of locating the framing bits in a bit stream; in both *Musgrave* and *Foster* computers were used to process seismograms; and in *Prater* the invention related to the spectrographic analysis of gases. All of the above cases and the present case have in common, however, the fact that they are the outgrowth of a blanket Patent Office policy, which remained in existence for some time after the decision of the board in this case, to deny claims such as those before us here on the ground that they were not for statutory sub-

ject matter.[5] This policy was later modified.[6] The decision here for review is a typical product of its time.

Reverting now to the first problem which confronts us, what rejection do we have before us for decision? We conclude, appellants' apprehension notwithstanding, that the examiner and the board relied on only one ground, predicated on 35 USC 101, that claims 8 and 13 are either directed to or at least embrace nonstatutory subject matter. Neither of them complained that the claims are unclear, ambiguous, indistinct, or otherwise incomprehensible so as not to comply with section 112, second paragraph. In *Mahony* we made it clear that "To inject any question of statutory subject matter into that paragraph is to depart from its wording and to complicate the law unnecessarily." The solicitor's attempt to build up a rejection on section 112 in order to defeat appellants under the second *Prater* case decision—a decision not rendered until five months after appellants filed their main brief in this court—must fail. It would have to fail in any case for, as appellants point out in their reply brief, in *Prater* appellants admitted in the course of the appeal that their claims read on a mental step implementation and we based our decision on that admission insofar as we affirmed the rejection, whereas here appellants have made no such admission and, for reasons

[5] For a full exposition of that policy see the speech of Commissioner of Patents Brenner of October 22, 1968, which is part of the proceedings of that year of the Computers-in-Law Institute, National Law Center, George Washington University, section B-1, entitled "The Future of Computer Programs in the U.S. Patent Office."

[6] See the speech by Commissioner Schuyler, October 8, 1969, 1969 Computers-in-Law Institute, Section H, entitled "Protecting Property in Computer Software."

hereinafter stated, we do not think the claims read on any "mental step" implementation.

We turn then to consideration of what the solicitor's brief admits is the "principal rejection" predicated on section 101, which we find to be the only rejection.

CLAIM 8

We have set forth claim 8 above and have stated that the examiner and board rejected it because they considered it to be directed to "mental processes" and "mathematical steps." The reasoning of the board's opinion bears a remarkable similarity to the opinion of the board in *Musgrave*, which is not surprising since it was the same board and the opinion was by the same member. The same line of cases is relied on here that was relied on in *Prater* and *Musgrave* and we have given them full consideration before, particularly in those two cases in which we considered at length the "mental steps" doctrine. One of the many sound ideas expressed in the concurring opinion delivered by Judge Baldwin in *Musgrave* is "that in reality very little remains [as a result of our recent decisions] of the 'mental steps' doctrine." Another is that as a result of *Prater* and *Mahony*—if, indeed, it has not always been so[1]—there is a "standard of reasonableness" in the interpretation of claims which is that they should be given the meaning they would have "to one of ordinary skill in the pertinent art when read in light of and consistently with the specification."

---

[1] See "Patent Claims" by Ridsdale Ellis (1949), Chapt. 3 entitled "General Rules of Claim Construction" especially Secs. 21, 22 referring to reasonableness in claim interpretation and citing decisions of the Court of Appeals for the District of Columbia in 1924 and 1915.

The question Judge Baldwin asked in *Musgrave* is the question we have here: "* * * would a *reasonable* interpretation of the claims include coverage of the process implemented by the human mind?" The answer clearly is "No," for the same reasons it had to be "No" in *Mahony* and in *Musgrave*. Claim 8 is for a method to be practiced in part on particular *apparatus* specified to be a "reentrant shift register." The first sentence of a three-paragraph definition of "shift register" in the "Condensed Computer Encyclopedia" edited by Jordain, McGraw-Hill Book Co. (1969), is: "A hardware element constructed so as to perform the shifting of its contained data." At argument, the Patent Office Solicitor admitted that the reference to this piece of apparatus in the claim was, for him, its "most embarassing phrase." It is not only a phrase, it is referred to expressly in elements (1), (2), (3), (4) and (7) and by implication in element (5) which refers to "shifting." Claim 8, moreover, refers to the operations of storing, shifting, and masking "signals" which, by a *reasonable* interpretation in the light of the specification, can only mean signals of the kind upon which the disclosed electronic digital computer hardware operates. The signals are like the "bits" and "bit streams" with which we were concerned in *Mahony*. Claim 8 therefore covers only a machine-implemented process and the apparatus for carrying it out has been disclosed. The process can be carried out with no intervention by a human being once the apparatus is set up—that is to say, the appropriate computer system has been assembled and programmed. The solicitor would have us hold the method is not a "process" within section 101 on the ground that a programmable computer is merely a "tool of the mind" and the method is basically "mental" in character, apparently because the "workstuff"

of the method is numbers which are mathematical abstractions. As the Patent Office would say, we do not find the argument persuasive. Cash registers, bookkeeping machines, and adding machines also work only with numbers but this has never been considered a ground for taking them out of the "machine" category of section 101.

CLAIM 13

This claim was rejected on the same ground as claim 8 from which it differs in containing no reference to any apparatus and in referring to the thing operated upon not as "signals" but as "representations." The claimed method is one for coverting "binary coded decimal number representations" into "binary number representations." The supporting disclosure against which the claim must be reasonably interpreted is the identical programmed digital computer system which supports claim 8. The operational steps to be carried out call for "testing each binary digit position" to determine whether it is a "binary '0' " or a "binary '1' " and performing a specified act according to what is found, i.e., moving to the next position if it is "0" and repeating the test or adding a binary "1" at two specified positions and then moving to the next position, and so on, each action being prescribed so that no human judgment or decision is required—merely observation and taking prescribed action according to what is observed. Apparatus, machinery, "hardware"—whatever it may be called—is disclosed by which the steps *can* be carried out without human intervention but at the same time, since the claim does not itself call for any particular hardware, the method within the claim can be practiced either with apparatus other than that described or with the simplest of

equipment which will enable one to provide and to manipulate "binary coded decimal representations" and convert them into "binary number representations." This could *in theory* be any kind of writing implement and any kind of recording medium—"pencil and paper"—or even, we suppose, red and blue poker chips and a surface to put them on or slots to put them in so that "0"s and "1"s can be represented.

It will aid in understanding the terms of claim 13 to state that the discovery which is the essence of appellants' invention was that, for each bit position in BCD digit, conversion can be accomplished by adding a binary "1" to two specific bit positions of the next lesser significant BCD digit and that in normal notation "significance" of bits or digits increases to the left, e.g., in the decimal number "53" the 5 is more significant than the 3. Thus conversion can be carried out by the steps of (1) testing each BCD bit position for all but the least significant BCD digit and (2) for each "1" bit detected, adding a binary "1" to each of two specified bit positions in the next lesser significant BCD digit.

The only argument put forward by the Patent Office for holding claim 13 non-statutory under section 101 is that the method is basically "mental" in character. Looking at the present case in the light of all its circumstances, we observe in claim 13 a process consisting of a sequence of steps which can be carried out by machine implementation as disclosed in the specification, by still another machine as disclosed during the prosecution, and even manually although in actual practice it seems improbable anyone would ever do that, speed measured in milli- or even micro-seconds being essential in the practical utilization of such a

process. Only in the manual performance would it require the operator even to think and then only to the extent necessary to assure that he is doing what the claim tells him to do. In no case is the exercise of judgment required or even the making of a decision as between alternatives.

Realistically, the process of claim 13 has no practical use other than the more effective operation and utilization of a *machine* known as a digital computer. It seems beyond question that the machines—the computers—are in the technological field, are a part of one of our best-known technologies, and are in the "useful arts" rather than the "liberal arts," as are all other types of "business machines," regardless of the uses to which their users may put them. How can it be said that a process having no practical value other than enhancing the internal operation of those machines is not likewise in the technological or useful arts? We conclude that the Patent Office has put forth no sound reason why the claims in this case should be held to be non-statutory.

The decision of the board is *reversed*.

APPENDIX B

United States Court of Customs and Patent Appeals

OCTOBER TERM, 1970—MAY 6, 1971

(In the Matter of the Application of Patent Appeal No. 8376, Gary R. Benson and Arthur C. Tabbot)

Subject Matter: Conversion of numerical information. Serial No. 315,050.

Said appeal having heretofore been brought on to be heard before the court and due consideration thereon having been had, it is ORDERED that the decision of the Board of Appeals be, and the same is hereby, reversed.

I, GEORGE E. HUTCHINSON, Clerk of the United States Court of Customs and Patent Appeals, do hereby certify that the above judgment and the attached opinion are true and correct copies of the judgment and opinion of said United States Court of Customs and Patent Appeals filed the 6th day of May, A.D. 1971, in the above-entitled appeal, as the same remain upon the files and records of said court.

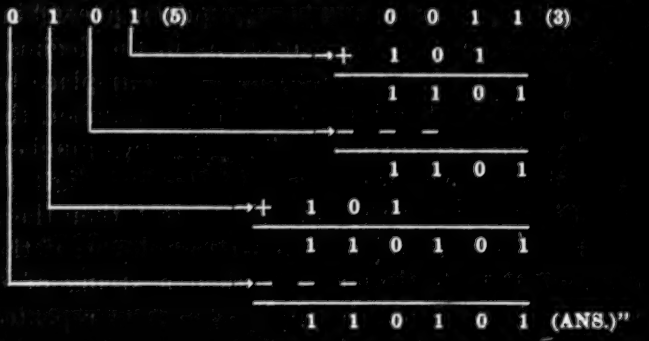
WITNESS my hand and the seal of this court this 7th day of June, A.D. 1971.

GEORGE E. HUTCHINSON,
Clerk.

APPENDIX C

Respondents submitted the following statement to the Patent Office to illustrate a manual way to carry out their method (claim 13):

"Finally, the method represented by these claims can also be carried out by hand, the shifting and adding operations being manual. The example used in the specification can be done by hand as follows:



The conventional process may be explained as follows:

The decimal number 53 in binary decimal form is 0101 0011 and in true binary form is 110101. The conversion may be effected in the following steps:

(1) For the binary equivalent of 5 and 3, consult a chart converting the first ten numbers from decimal to binary form. See Statement, *supra*.

(2) Since decimal $53=(5\times10^1)+(3\times1)$, binary coded decimal 53, which uses the decimal system of place values, must be the binary equivalent of 5 multi-

plied by $10^1{}_d$* plus the binary equivalent of 3 multiplied by 1_d, or ($[0101\times10^1{}_d]+[0011\times1_d]$). When the multipliers $10^1{}_d$ and 1_d are converted to binary numbers we have ($[0101\times1010]+[0011\times0001]$).

(3) To obtain the final true binary expression of 53 all that need be done is to complete the indicated multiplications and addition.

Addition in binary has four possibilities: $0+0=0$; $0+1=1$; $1+0=1$; $1+1=10$, i.e., 0 and "carry" 1, because 10 binary=2 decimal. The multiplication of one-digit binary numbers is even simpler: $1\times1=1$; any other combination, such as 1×0 or 0×0, yields 0. To multiply larger numbers requires a combination of addition and multiplication, as in the decimal system. For example, to multiply one four-place binary number by another four-place binary number, the following steps are involved: First, the two numbers are written, one over the other. If the last digit (least-significant digit of the multiplier) is *1*, then the product, *i.e.*, the multiplicand, is written down; if the last digit of the multiplier is *0*, then a string of *0*'s is written down. The same process is then repeated for the next to the last digit of the multiplier, with the results shifted one position to the left; and for the third from the last digit of the multfplier, with the results shifted another space to the left. Finally, the process is repeated with the first digit (that in the most-significant digit position), with still another position shift to the left. The answer is the sum of these results.

Applying this process to the multiplication of the decimal number 10 by decimal 5, which is equivalent

*The subscript "d" symbolizes a decimal number. Similarly, the subscript "b" symbolizes a binary number.

to multiplying binary 1010 by binary 0101, the following steps are taken:

```
  1010
 ×0101
------
  1010
 0000
1010
000
------
110010.
```

Since 3 x 1=3 it is unnecessary to perform this step. Instead, the binary equivalent of 3 (0011) is simply added directly to the binary equivalent of 50 (110010) computed above:

```
  110010
+   0011
--------
  110101.
```

The program claimed by the applicants constitutes the foregoing steps, described and translated into computer language. As the illustration of the applicants' method discloses, they prescribed the steps recited above, with only the following differences:

(1) Decimal 3 (binary 0011) is added in at the beginning, instead of the end, of the routine.

(2) Decimal 10 (binary 1010), the multiplier, is written as binary 101, followed by a blank space instead of the terminal 0; so that 101 shifted one space to the left replaces 1010.

(3) The applicants take a subtotal after each successive operation, rather than the single subtotal at the end of multiplication shown above.

APPENDIX D

168 Decision of Board of Appeals, January 31, 1968 Before Kreek, Keely and Andrews, Examiners-in-Chief. Andrews, Examiner-in-Chief.

This is an appeal from the final rejection of claims 1, 2, 4 to 9, 11, 12 and 13. Subsequent to the appeal appellants directed the cancellation of claims 1, 2, 4 to 7, 9, 11 and 12, in a portion of an amendment entered 169 by the Examiner, so that the appeal as to these claims herewith is dismissed. This leaves for our consideration on appeal claims 8 and 13, which are all the claims remaining in the application. The amendments to claim 13 as proposed by the amendment of August 31, 1967, were not entered by the Examiner and will not be considered by us.

Claims 8 and 13 read as follows:

8. The method of converting signals from binary coded decimal form into binary which comprises the steps of

(1) storing the binary coded decimal signals in a reentrant shift register,

(2) shifting the signals to the right by at least three places, until there is a binary "1" in the second position of said register,

(3) masking out said binary "1" in said second position of said register,

(4) adding a binary "1" to the first position of said register,

(5) shifting the signals to the left by two positions,

(6) adding a "1" to said first position, and

(7) shifting the signals to the right by at least three

positions in preparation for a succeeding binary "1" in the second position of said register.

13. A data processing method for converting binary coded decimal number representations into binary number representations comprising the steps of

(1) testing each binary digit position 1, beginning with the least significant binary digit position, of the most significant decimal digit representation for a binary "0" or a binary "1";

(2) if a binary "0" is detected, repeating step (1) for the next least significant binary digit position of said most significant decimal digit representation;

(3) if a binary "1" is detected, adding a binary "1" at the (i + 1)th and (i + 3)th least significant binary digit positions of the next lesser significant decimal digit representation, and repeating step (1) for the next least significant binary digit position of said most most significant decimal digit representation;

(4) upon exhausting the binary digit positions of said most significant decimal digit representation, repeating steps (1) through (3) for the next lesser significant decimal digit representation as modified by the previous execution of steps (1) through (3); and

(5) repeating steps (1) through (4) until the second least significant decimal digit representation has been so processed.

Since neither of the references cited in the Examiner's Answer was applied against either claim before us on appeal, we need not consider these references.

Claims 8 and 13 stand rejected as for subject matter not embraced by 35 U.S.C. 101 in that they set forth "mental processes" and "mathematical steps,"

neither being an "art" as construed by a long line of decisions, such as:

Cochrane et al. v. Deener et al., 1877 C. D. 242, 94 U.S. 780, 11 O. G. 687

In re Abrams, 38 CCPA 945, 188 F. 2d 165, 1951 C. D. 264, 648 O. G. 663, 89 USPQ 266

Halliburton Oil Well Cementing Company v. Walker et al., 146 F. 2d 817, 64 USPQ 278

In re Yuan, 38 CCPA 967, 188 F. 2d 377, 1951 C. D. 286, 648, O. G. 967, 89 USPQ 324

In re Venner et al., 46 CCPA 754, 262 F. 2d 91, 1959 C. D. 174, 739 O. G. 812, 120 USPQ 192

Ex parte Jenny, 773 O. G. 913, 130 USPQ 318

Appellants by their brief and reply brief and at the hearing strongly urge that the instant claims should be construed to be within the statutes and that the prior decisions should not be extended to bar claims to a process even though capable of being carried out in the
171 mind where there is a disclosure in the specification that the process could be carried out also on a machine, such as a stored program electronic computer. Appellants include, as Appendix D of their brief, appellants' attorneys' comments on the proposed "Guidelines to Examination of Programs," as published in 829 O. G. 1, August 2, 1966.

We have reviewed the rejection of claims 8 and 13 against the background of the cases cited by both the Examiner and the appellants together with the comments by each and we find we are in agreement with the position of the Examiner that the appealed claims set forth subject matter not embraced by 35 U.S.C. 101 within the term "art" as interpreted in Cochrane et al. v. Deener et al., *supra*.

We are not convinced by appellants' arguments to the effect that the disclosure in an application, not the claims thereof, should be the proper basis for judging

whether the claims are drawn to subject matter outside the statute. Certainly a claim which embraces that which was already in the prior art or was obvious therefrom could not be sustained under 35 U.S.C. 102 or 103 merely because there may have been something patentable disclosed in the specification. 35 U.S.C. 112 requires the claim to point out the subject matter which the applicant regards as his invention so that a claim which is so broad and indistinct as to embrace within its terms subject matter that can not be patented under section 101 of the statue, similarly must be unpatentable.

We note particularly that claim 13 is so broad as to read on the mental activity alone of a mathema-
172 tician while carrying out a set of rules or, more precisely, an algorithm, that expresses a relation of one arbitrary system of symbolizing an abstract number to another system for symbolizing the same abstract number. There is no physical act on a physical thing suggested by this claim and it is merely the definition of a mathematical algorithm.

The fact that a mathematician may, as an aid to his memory, routinely elect to record on a suitable medium the symbols incident to his following the procedure specified by an algorithm, such as pencil and paper or other conventional computational apparatus, does not change the basic character of the process from its being an intangible, abstract line of reasoning.

In fact it is generally recognized that any algorithm suggest the use of such aids to understanding, as for example in:

Knuth "What Is An Algorithm?" *Datamation*, October, 1967, pp. 30–32

it is stated at page 31:

"So much for the form of algorithms; now let us perform one. It should be mentioned immediately that the reader *should not expect to read an algo-*

rithm like he reads a novel; such an attempt would make it pretty difficult to understand what is going on. An algorithm must be seen to be believed, and the best way to learn what an algorithm is all about is to try it. The reader should always take *pencil and paper* and work through an example of each algorithm immediately upon encountering it in the text. Usually the outline of a worked example will be given, or else the reader can easily conjure up one. This is a simple and painless method for obtaining an understanding of a given algorithm, and *all other approaches are generally unsuccessful.*" (Emphasis added).

Thus it is to be seen that denying to the mathe-
173 matician, as the appealed claims would do, access to the usual tools of his profession, such as pencil and paper or a programmable computer, is to deny him an opportunity to understand appellants' mathematical algorithm. Such denial is a restriction on mental process and is tantamount to granting a patent thereon. It is not seen how such restriction on mental processes could promote science or the useful arts.

Appellants argue that restriction of the claimed method by terms such as "signals" in claim 8 or "electrical signals," as they unsuccessfully proposed to amend claim 13, prevents the reading of the claims on mental steps.

A reading of the claims shows that the method is not a physical act on anything but is dealing with a manipulation of the *meaning* represented by signals. Note that claim 8 does not purport to operate on the physical signals themselves, but only on the *coded* form thereof and claim 13 clearly specifies operation on the *representation* in coded form.

The *coding* of or the *representation* made by an arrangement of signals is, itself, merely a mental interpretation and has significance only where there

is a prearranged understanding of some meaning or thought to be expressed and these vary with the person involved. For example, a series of four successive vertical marks or "ones," to a tally clerk, means a count of *four;* to a student of decimal arithmetic, means the decimal number *1,111;* to a programmer of an octal
174 computer, means *17* and to a programmer of a hexadecimal computer means *F or 15.* Thus a method, as here, which deals with manipulations of the meanings or representations made by signals is a method of manipulating mental concepts and not of physical things.

Claim 8 specifies the step of storing signals in a "shift register." This requires no more than the writing of the symbols constituting the augend on a piece of paper as an aid to one's memory since the paper can be shifted right or left any number of intervals so as to align the augend with a fixed position of the addend. Furthermore it is a trivial choice in the programming of a computer whether the relative shifting is accomplished by use of the conventional shift register for the augend or by modification of the relative address in the instruction directing the addition of the addend, as is also routine. The relative efficiency of either choice to a mathematician or programmer would be obvious from the computer employed.

Since this Board is of the opinion that the methods here claimed are non-statutory, consonant with a long line of decisions, it doubts the wisdom of here attempting to arrive at an opposite conclusion as to the same statute solely on the basis of an ex parte showing of advantage.

For the reasons set forth above as well as for the reasons advanced by the Examiner, the rejection of claims 8 and 13 is sustained.

175 The decision of the Examiner is affirmed.

AFFIRMED

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IN THE

Supreme Court of the United States

OCTOBER TERM 1971

No. 71-485

ROBERT GOTTSCHALK, Acting Commissioner of Patents,
Petitioner,

v.

GABY R. BENSON and ARTHUR C. TABBOT,
Respondents.

On Petition for Writ of Certiorari to the United States Court of Customs and Patent Appeals

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MOTION FOR LEAVE TO FILE BRIEF AMICUS CURIAE

The Business Equipment Manufacturers Association (BEMA) respectfully moves for leave to file the attached Brief Amicus Curiae in the above-entitled case. Petitioner has consented to the filing of this

brief. The consent of respondents was requested but refused.

BEMA is the trade association which has represented the business equipment industry for the past 54 years. The sixty-five (65) companies comprising the current BEMA membership include the nation's leading manufacturers of computers and computer-related equipment. While product lines of member companies vary widely, the following list is illustrative: electronic computers, computer software, including programs, computer input and output devices, computer storage devices, support services, data transmission equipment, optical character readers, addressing machines, accounting machines, bookkeeping machines and office copying machines. The extent to which such equipment can be effectively utilized depends in great measure on the applications and systems programs developed by computer programmers to control the operations of these machines. BEMA is also the approved sponsor under the American National Standards Institute (formerly the American Standards Association) for the establishment of domestic and international standards related to information processing, computers and office machines.

One of BEMA's three semi-autonomous product area groups—the Data Processing Group (DPG)—is especially concerned with the outcome of the issues presented in this case. The members of DPG have consistently been forerunners in achieving major developments, in both the concept and application, of computer programming and data processing, and have contributed greatly to the present significant status and role of the computer in modern society. These members maintain extensive programs devoted to

applied research and systems development in all phases of computer use and data and information processing.

It is readily apparent that the subject matter of the present case is of vital concern to the BEMA membership as well as to non-BEMA members in the computer and data processing field and, more importantly, to the government and public. The final outcome of the issues squarely presented in this case will have a significant influence upon both the immediate and the future planning of DPG members with respect to computer program development and research. Thus, the outcome of the present case will inevitably affect the future growth and development of the data processing industry in the United States and will have a corresponding or greater impact on the vast segments of our society which use and receive the benefits of technological advances in the industry.

The attached Brief Amicus Curiae presents three important aspects of this case which were not fully treated in the Solicitor's petition: first, the question of probable impediments to the future technological development of the data processing industry which would result from the decision of the United States Court of Customs and Patent Appeals; second, the critical necessity for a definitive resolution of this issue now in order to avoid (a) the inevitable difficulties and uncertainties which will flow from the lower court's decision, (b) the expected flood of complex patent infringement suits which will surely follow, and (c) the resultant damage to the technological promotion of the art and the public which it services; third, the substantial questions of constitutional and statutory construction raised by the lower court decision.

Accordingly, BEMA respectfully requests that this Court grant leave to file the attached Brief Amicus Curiae.

Respectfully submitted,

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November 11, 1971

IN THE

Supreme Court of the United States

OCTOBER TERM 1971

No. 71-485

ROBERT GOTTSCHALK, Acting Commissioner of Patents,
Petitioner,

v.

GARY R. BENSON and ARTHUR C. TABBOT,
Respondents.

On Petition for Writ of Certiorari to the United States Court of Customs and Patent Appeals

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BRIEF AMICUS CURIAE FOR THE BUSINESS EQUIPMENT MANUFACTURERS ASSOCIATION

I

QUESTION PRESENTED

Whether a computer program constitutes patentable subject matter under the patent clause of the Constitution and applicable provisions of the Patent Code.

II

INTEREST OF THE BUSINESS EQUIPMENT MANUFACTURERS ASSOCIATION

The Business Equipment Manufacturers Association (BEMA) is the trade association which represents the major manufacturers of computers and related equipment[1] as well as the office machines and office equipment manufacturing industries. BEMA's interest in this case is that the lower court's decision will inevitably bring about a chaotic situation to the detriment of the producers and users of computers, and to the public which they serve. Accordingly, whether or not the decision of the lower court is reversed or upheld is, in BEMA's view, a secondary consideration to the importance of having the issue definitively decided now by this Court.

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[1] The Data Processing Group of BEMA consists of the following companies:

Addressograph Multigraph Corporation
Ampex Corporation
Burroughs Corporation
Computer Machinery Corporation
General Electric Company
GTE Information Systems, Inc.
Honeywell, Inc.
IBM Corporation
Moore Business Forms, Inc.
Mosler
The National Cash Register Company
Olivetti Corporation of America
Pitney-Bowes, Inc.
RCA Corporation
Control Data Corporation
Data Products Corporation
Data Recall Corporation
Digitronics Corporation
The Singer Company
Sperry Rand Corporation
The Standard Register Company
TRW Data Systems, Inc.
Tally Corporation
UARCO, Inc.
Wang Laboratories, Inc.
Xerox Corporation

III

REASONS FOR GRANTING THE WRIT

A. Unless the question of patentability of computer programs is finally resolved now by this Court, the uncertainty resulting from the lower court's decision will impede future technological developments to the overall detriment of the public

By requiring the Patent Office to issue a whole new class of patents on computer programs, the court below has brought about a basic structural change in the computer industry which will impede development of future technology to the detriment of the public. Many thousands of arguably new computer programs are developed each year, principally by computer users, and a large proportion of these will now be patented. However, because of substantial disagreement as to the validity and ultimate scope of such patents, years of infringement litigation can be expected.[2] In this atmosphere, more restrictive practices of handling programming information will develop. Such practices will not be in the public interest, and will ultimately impede the advance of the overall "state of the art".

In addition, substantial practical impediments will be imposed on users of computers as a result of this decision. Computers are now being used virtually in all segments of our society and even under presently known technology the next decade will see a whole spectrum of new uses and applications touching on every aspect of human development. However, as a

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[2] BEMA estimates that as a direct result of this decision literally thousands of patents of dubious validity will be issued, each one subject to the financial burdens and stultifying effect of threatened patent litigation.

result of the instant decision all users of computers will have to assume a major responsibility for determining questions of patent infringement growing out of computer programs they intend to use. They will be burdened with the need to spend substantial time and money in right-to-use searches every time a different algorithm is to be programmed on an existing computer. Adversely held patents based on computer programs will be a constant threat to the right of computer users to make full use of computers owned or leased by them.

Furthermore, it is expected that in the next few years, computers will be widely used on a shared-time basis and the existence of patent monopolies on computer programs may seriously impede effective development and utilization of these multi-user systems. Often the proprietor of the computer in such systems does not know what programs the user is using, and the user will frequently not be fully acquainted with all of the details concerning the structure and make-up of the computer. It will be substantially impossible for either of them to make an adequate right-to-use search and determine whether existing computer program patents could be infringed.

It is also noteworthy that the tremendous development in computer programs, also known as software, since the early 1950's has essentially taken place in a legal atmosphere conducive to the free exchange of ideas and information. For example, in 1966 when the Department of Justice examined the computer programming field it found:

> "Growth in the software portion of the computer industry has been facilitated by a remarkably free and easy exchange of ideas, concepts, and pro-

grams. One of the notable features of the programming industry, indeed, has been the widespread establishment, sponsorship, and universal acceptance of joint user groups to facilitate the exchange of programs and algorithms. As a result, for the past twenty years, *almost all basic ideas in computer programming have been available openly to all computer users.*" (Emphasis added).[3]

In this free setting, computer technology was able to develop within the decade to a point of sophistication making possible man's voyage to the moon.

Also, in terms of economic significance, the commercial computer industry has been able to grow, without patent protection for computer programs, from virtually nothing in the early 1950's to the point

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[3] Letter dated October 21, 1966, from Donald F. Turner, Assistant Attorney General, Antitrust Division, to Edward J. Brenner, Commissioner of Patents. This letter further states that as a matter of public policy patents should not be granted:

"One of the major policy arguments advanced for extension of patent protection to computer programs is a supposed need to encourage individuals and companies to invest in programming development. But it is difficult to conceive how the field of programming could have grown faster, or that its past growth has been hampered in any meaningful fashion by a lack of investment funds. If anything, the current free interchange of programs has led to an extraordinarily efficient use of scarce programming talent and has kept needless duplication of existing programs and techniques to a minimum. Furthermore, many small software companies have achieved financial and technical success by producing more efficient versions of widely used manufacturer-developed programs. These more efficient versions of operating programs benefit other software producers, computer manufacturers, computer users, and the general public. In the light of past experience, any step which could upset the vital interchange of programming material should be approached with the utmost caution."

where today there are in use over 140,000 computer systems made by American based companies, with a cumulative value in excess of $43 billion.[4] This growth rate will accelerate, and it has been reliably estimated that by 1975 there will be in use over 350,000 computer systems with a value in excess of $82 billion.[5] Moreover, computer users are already spending as much on programming today as they are on computer hardware. In a matter of less than five years they will be spending twice as much on the programs as on the machines, and the so-called software segment of the computer industry will more than double in size.[6]

The future applications for computers are virtually unlimited and some widely accepted predictions for computer uses in the next 10 to 25 years are:

Health and Medicine:

> Computers will revolutionize health care and will serve as communication and information links among various hospital centers and individual doctors' offices or clinics to improve diagnosis, patient care and medical data. Computers will also make possible many breakthroughs in medical research, including a cure for cancer.

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[4] EDP Industry Report, March 12, 1971, Vol. 6, No. 9, at p. 7. These figures are for worldwide use of computers made by American companies. In the United States alone, the cumulative value of computer systems in use in 1971 was approximately $27 billion and by 1975 this figure will exceed $44 billion.

[5] *Id.* at p. 12. It is also reported that in 1971 total revenue for American-based companies from computers and related activities will be $13.7 billion and that in 1975 total revenue will be $25.6 billion.

[6] "Towards the Computer Utility: Evolution or Revolution", *Datamation*, October 1969, p. 125.

Education:

In the field of education, computer aided training and instruction will become commonplace, and for the first time high quality education will be available to all children on an equal basis, including those in ghettoes and remote rural areas. Also, computers will be largely responsible for making it practical for everyone to have the advantages of higher learning.

Science:

Computers will make possible further advances in science, such as exploration of space, including interplanetary travel.

Information Processing:

High speed computer systems, on a global basis, will transmit data and messages instantly between any two points on earth or colonized space. Government officials, businessmen, scientists, students, even housewives and children will be able to converse with these computers and obtain information they need as easily as they now talk by telephone.

Government:

Computers will present unique opportunities for government to become more efficient and effective. For example, there are tremendous potentials for computers to assist in relieving the nation's crowded court dockets, to collect and analyze legal documents and precedents, and to achieve better overall administration of the rapidly increasing work load of the police and law enforcement agencies.

Economics:

Computers will soon handle most credit and monetary transactions, thereby substantially limiting the need for cash and checks.

Written Communications:

The use of mail service will be significantly affected by computer oriented techniques and alternative means of communicating data. Frequently encountered delay in communicating important written material will be largely eliminated and will be replaced by point-to-point transmission of data and information.

Transportation:

More efficient transportation systems will be made possible, including computerized control of automobiles and rapid transit systems.

Home and Office:

Home and office use of centralized computers serving the needs of many users will become common in a few years, and these computers will assist in performing many functions such as climate and lighting control, food procurement, budgeting, medical care, etc.

The few examples cited above show that computers have a potential substantially to upgrade the quality of life for every American. To a significant extent, though, whether the future potential of computers is fully realized depends on the legal framework within which the computer industry continues to develop.

The lower court in this case by giving legal sanction to patent monopolies over computer programs has substantially altered the legal framework within which the industry has grown in the last 25 years. The court has consciously departed from the heretofore prevailing system of encouraging the free exchange of ideas concerning technological developments in this important area and has submitted a system which will necessarily restrict the free dissemination of ideas and information

on developments in computer programming. Before such a restrictive system is broadly applied to a technology affecting so many parts of our society, this Court should finally determine the question of whether patents may properly be issued for computer programs.

In view of the above, it is submitted that since the practical result of the instant decision will be to bring about an era of uncertainty and confusion in the data processing industry and specifically in the development of computer programs, the question presented here should be determined now with finality.

B. The question presented by the decision below should be reviewed now

The Court of Customs and Patent Appeals has already held at least seven computer program applications patentable—i.e., in the decision below and in the decisions in the *Prater II*, *Musgrave*, *Mahony*, *Foster*, *Bernhart*, and *McIlroy* cases.[7]

Because of these decisions, the Patent Office is no longer following its prior policy of rejecting applications for patents on computer programs because they are based upon mental steps which are not a patentable "process" under §§ 100(b) and 101 of the Patent Code, Title 35, U.S.C.[8] Accordingly, the basic objection

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[7] *In re Prater*, 415 F.2d 1378 (C.C.P.A. 1968), *mod. on reh.*, 415 F.2d 1393 (C.C.P.A. 1969); *In re Musgrave*, 431 F.2d 882 (C.C.P.A. 1970); *In re Mahony*, 421 F.2d 742 (C.C.P.A. 1970); *In re Foster*, 438 F.2d 1011 (C.C.P.A. 1971); *In re Bernhart*, 417 F.2d 1395 (C.C.P.A. 1969); *In re McIlroy*, 170 U.S.P.Q. 31 (C.C.P.A. 1971).

[8] See S. Doc. No. 5, 90th Cong., 1st Sess. 21 (1967); Patent Office, Guidelines to Examination of Application for Patents on Computer Programs, 33 Fed. Reg. 15609 (1968); Patent Office, Suspension of Guidelines to Examination of Application for Patents on Computer Programs, 34 Fed. Reg. 15724 (1969).

that computer programs are not patentable subject matter will not be raised again by the Patent Office as a basis for refusing an application, and many thousands of such patents will be issued even though this Court has not finally determined this important issue.

Until the basic question of patentability of computer programs is resolved by this Court, those who create and use programs will be compelled to operate in an atmosphere of distrust and secrecy and even to engage in protracted litigation in infringement suits. It can be anticipated that rights under the thousands of computer program patents which must be issued by the Patent Office as a result of this decision will be licensed and users will have the option of either accepting the licensed terms or contesting the validity of the underlying claims upon which the patents are based in infringement litigation brought by the holder of the patent. In such litigation, the user's most basic defense will be that such programs are not patentable subject matter under the Constitution and the Patent Code. The decision of the Court of Customs and Patent Appeals in this case will not be binding precedent on the various federal district courts and circuit courts of appeals which must decide these infringement suits, and in view of the substantial difference of opinion on this question, it is reasonable to expect that conflicting decisions will occur.

To defer review of the issue of patentability of computer programs *vel non* until patent infringement litigation eventuates and matures to the point of reaching this Court will simply multiply the opportunities for endless litigation. Not only *all* of the computer program patents so far issued, but *each* claim of each, is *statutorily presumed* valid (35 U.S.C. § 282). Even

should one or more claims of *one* of these many patents be held invalid by this Court after time-consuming infringement litigation and appeals, the statutory presumption of validity attaching to each claim of each of the remaining patents will *still* remain. For an example of the way in which patents on the same general subject, *all* presumptively valid, proliferate and result in endless litigation, see the discussion of patents in the shoe machinery industry in *Williams Mfg. Co.* v. *United Shoe Machinery Corp.*, 316 U.S. 364, 371 (1942), Mr. Justice Black dissenting, especially at 372-3, 381-2 and 392-4.

It is thus apparent that since the issue of patentability of computer programs is now ripe for final resolution by this Court, it is imperative for the orderly development of future technology in this important area that there be a final resolution now of this issue.

C. The decision of the lower court raises substantial questions of constitutional and statutory interpretation that should be finally resolved by this Court

There is a serious question whether the claim asserted in this case is one of the "discoveries" contemplated by the patent clause of the Constitution, which provides:

> "The Congress shall have power . . . to promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries." [Art. I, § 8, cl. 8]

The focus of the patent clause (and the statutes implementing that clause) is on "progress" and Congress is granted only a "qualified authority . . . *limited to the promotion* of advances in [science and] the useful arts." *Graham* v. *John Deere Co.*, 383 U.S.

1, 5 (1966). Because "[t]he patent system must promote . . . progress," *Graham, supra,* "[p]atents cannot be sustained when . . . their effect is to subtract from former resources freely available to skilled artisans," *Great A & P Tea Co. v. Supermarket Equipment Corp.,* 340 U.S. 147, 152 (1950). Among such "resources" as the Solicitor General's petition in this case states, are the "scientific principles, mental processes and abstract intellectual concepts" which "are the basic instruments of scientific and technological development" (Petition, p. 8).[9]

The claims in this case have been described in the following relatively simple language by the Patent Office Examiner who initially reviewed them:

> "The method claimed is merely a program which is a set of instructions to control the operation of a computer. The instructions are not a statutory process such as a method of manufacturing an article, but a logical list of mental steps which can be applied to a computer to allow it to imitate the mental steps" (R. 18).[10]

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[9] It is also apparent that any efforts to sanction the patenting of computer programs inherently raises serious constitutional questions under the First, Ninth and Tenth Amendments to the Constitution. The patent clause in Article I, Sec. 8, of the Constitution must be construed in light of the other constitutionally assured rights, and freedom of mind or thought may not be abridged by the patent laws.

[10] The significance of the instant decision is that it makes it possible for someone to obtain a patent on claims covering a method or algorithm for solving problems, regardless of the nature of the apparatus used to accomplish this end. Indeed, the Court of Customs and Patent Appeals noted that the method encompassed by the claim in this case could theoretically be implemented by any kind of recording medium, including "pencil and paper and even, when possible, red and blue poker chips and a surface to hold them or slots to put them in so that 'o's and l's' can be represented."

Because of the nature of the claims, the Patent Office Board of Appeals in its opinion found, as a fact, that they could not be patentable "processes" under the relevant statutory provisions:

> ". . . that claim 13 is so broad as to read on the mental activity alone of a mathematician while carrying out a set of rules or, more precisely, an algorithm, that expresses a relation of one arbitrary system of symbolizing an abstract number to another system for symbolizing the same abstract number. There is no physical act on a physical thing suggested by this claim. . . .
>
> "The fact that a mathematician may, as an aid to his memory, routinely elect to record on a suitable medium the symbols incident to his following the procedure specified by an algorithm, such as pencil and paper or other conventional computational apparatus, does not change the basic character of the process from its being an intangible, abstract line of reasoning." (Solicitor General's Pet. App. D, p. 39).

The Board also found:

> "Thus it is to be seen that denying to the mathematician, as the appealed claims would do, access to the usual tools of his profession, such as pencil and paper or a programmable computer, is to deny him an opportunity to understand appellants' mathematical algorithm. Such denial is a restriction on mental process and is tantamount to granting a patent thereon. It is not seen how such restriction on mental processes could promote science or the useful arts." (Solicitor General's Pet. App. D, p. 40).

And further found:

> ". . . a method, as here, which deals with manipulations of the meanings or representations made by

signals is a method of manipulating mental concepts and not of physical things." (Solicitor General's Pet. App. D, p. 41).

In view of these findings by the Patent Office Examiner and Board of Appeals, it is apparent that there is substantial doubt that the claims involved here are a patentable "process." [11] Indeed, this Court, in the landmark decision of *Cochrane* v. *Deener*, 94 U.S. 780 (1877), observed that basic scientific truths and mental abstractions cannot be patentable as a "process," [12] and this principle has become settled law. See, e.g. *Tilghman* v. *Proctor*, 102 U.S. 279 (1881); *The Telephone Cases*, 126 U.S. 1 (1887); *New Process Fermentation Co.* v. *Maus*, 122 U.S. 413 (1887); *Expanded Metal Co.* v. *Bradford*, 214 U.S. 366 (1909); *DeForest Radio Co.* v. *General Electric Co.*, 283 U.S. 664 (1931); *Mackay Radio and Tel. Co.* v. *R.C.A.*, 306 U.S. 86 (1939); and

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[11] Normally, fact findings by the administrative tribunal are conclusive on the CCPA, an appellate tribunal, unless demonstrated to be clearly erroneous. *In re Kunzmann*, 326 F.2d 424 (CCPA 1964); *Application of Wintzel et al.*, 39 F.2d 669 (CCPA 1930); *Zenith Radio Corp.* v. *Ladd*, 310 F.2d 859, 862 (D.C. Cir. 1962); and *Lyman* v. *Ladd*, 347 F.2d 482 (D.C. Cir. 1965).

[12] *Cochrane* v. *Deener* defines a patentable process as follows (94 U.S. at 788):

> • • • A process is a mode of treatment of certain materials to produce a given result. It is an act, or a series of acts, performed upon the subject-matter to be transformed and reduced to a different state or thing. If new and useful, it is just as patentable as is a piece of machinery. In the language of the patent law, it is an art. The machinery pointed out as suitable to perform the process may or may not be new or patentable; whilst the process itself may be altogether new, and produce an entirely new result. The process requires that certain things should be done with certain substances, and in a certain order; but the tools to be used in doing this may be of secondary consequence.

Funk Brothers Seed Co. v. Kalo Inoculant Co., 333 U.S. 127 (1948).[13]

Further, the decision by the lower Court in this case clearly illustrates its continuing and substantial dispute with the Patent Office over whether the standards of patentability set forth in *Cochrane, supra*, prevent computer programs from being patented.[14] Subsequent infringement litigation over patents of this nature which the Patent Office must now issue will almost inevitably result in a similar dispute between the CCPA and some federal district courts and circuit courts of appeal. The net result will be chaos and confusion in the computer industry and the public will be irrevocably harmed.

This Court perceived the serious nature of such a conflict in *Brenner v. Manson*, 383 U.S. 519 (1966), and wisely granted certiorari to resolve the "running dispute" between the Patent Office and the CCPA over the definition of "utility" in chemical process claims. The Court noted that in addition to the conflict between the CCPA and the Patent Office, an arguable conflict existed between the CCPA and the Court of Appeals for the District of Columbia.

In *Graham v. John Deere Co.*, 383 U.S. 1 (1966), this Court also recognized that a definitive decision was necessary to prevent an unnecessary waste of judicial and administrative resources where a substantial conflict had developed between the Patent Office and the CCPA.

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[13] Also, cf. *LeRoy v. Tatham*, 55 U.S. 156 (1852); *O'Reilly v. Morse*, 56 U.S. 62 (1853).

[14] See cases cited in n. 6, p. 9, *supra*, wherein the CCPA has reversed Patent Office rejection of process claims on the ground that they are purely "mental steps."

As the Court noted in that case: "To await litigation is—for all practical purposes—to debilitate the patent system."

Accordingly, in view of the substantial constitutional and statutory questions presented here and further in view of the significance of the subject matter of this case, it is clear that this Court should finally resolve this controversy now.

CONCLUSION

For the foregoing reasons, we respectfully submit that the Solicitor General's petition for a writ of certiorari should be granted.

Respectfully submitted,

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November 11, 1971

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IN THE

Supreme Court of the United States

Supreme Court, U.S.
FILED
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E. ROBERT SEAVER, CLERK

No. 71-485

ROBERT GOTTSCHALK, Acting Commissioner of Patents,

Petitioner,

v.

GARY R. BENSON and ARTHUR C. TABBOT,

Respondents.

ON PETITION FOR WRIT OF CERTIORARI TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS

MOTION FOR LEAVE TO FILE BRIEF AMICUS CURIAE AND BRIEF AMICUS CURIAE FOR THE INFORMATION INDUSTRY ASSOCIATION

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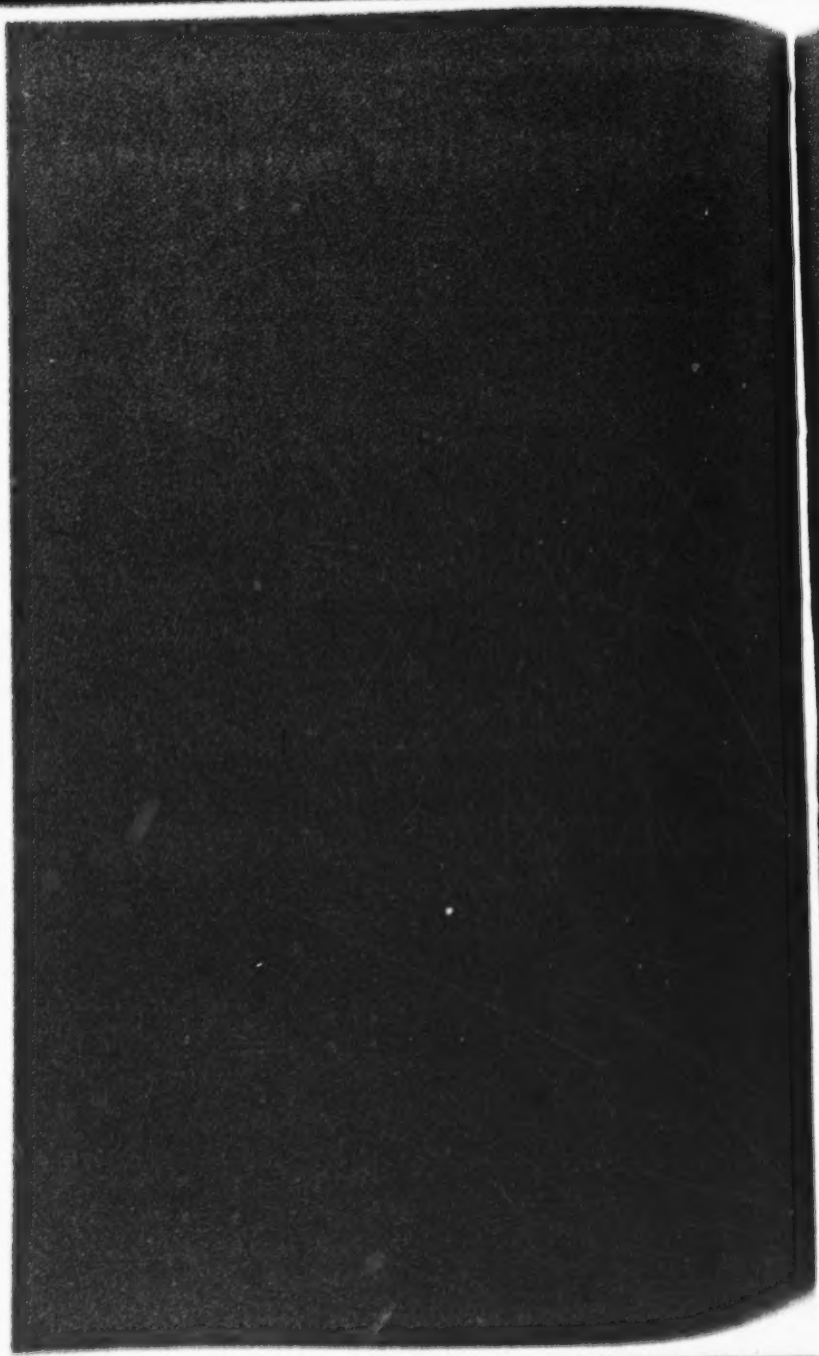

IN THE SUPREME COURT OF THE UNITED STATES

No. 71-485

ROBERT GOTTSCHALK, Acting
Commissioner of Patents,
Petitioner,

v.

GARY R. BENSON and ARTHUR C. TABBOT,
Respondents.

ON PETITION FOR WRIT OF CERTIORARI TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS

MOTION FOR LEAVE TO FILE BRIEF AMICUS CURIAE

The Information Industry Association respectfully moves for leave to file the attached Brief Amicus Curiae in the above-entitled case. Petitioner has consented to the filing of this Brief. Consent has been refused by counsel for respondents.

Applicant respectfully submits that the attached Brief Amicus Curiae will be of assistance to this Court. The reasons that applicant believes its motion should be granted are as follows:

The Information Industry Association was organized in 1968. Its 42 voting and 11 nonvoting members are for-profit organizations concerned with information production, storage, retrieval, processing and distribution. They include many small, relatively young corporations offering specialized services as well as larger publishing and communications firms.[1] Their business products include *inter alia* publications such as indexes, abstracts, citation lists, mail order catalogs, parts lists, price lists, directories, and services such as file searches, searches of current publications, and exhibits or demonstrations for educational, promotional, or merchandising purposes. These businesses depend upon the use of computers to process, store and update information, to search for and retrieve particular pieces of information from all of the information stored, and to assemble and transmit information products from storage.

Computer programs are essential to nearly all of this work. The information industry has experienced rapid growth and great innovation in recent years. Many novel and extremely useful computer programs have been and are being developed within the industry or by suppliers for the use of the industry. The industry is vigorously competitive.

Although computer programs have been written in greatly increasing numbers since 1952[2] and many such programs have been brilliantly innovative, until October, 1969 patent protection was unavailable because the Patent Office had

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[1] A list of members is attached as Appendix A hereto.

[2] In 1952 John von Neumann and his associates at the Institute for Advanced Study completed the Mathematical Analyzer, Numerical Integrator and Computer (MANIAC I), the first computer capable of using a flexible stored program that could be changed at will. Prior models were wired to perform a specific sequence of calculations and if different calculations were required, the computer had to be extremely rewired. *See* Stanislaw M. Ulam, *Computers, Scientific American*, Vol. 211, No. 3, p. 203 (September, 1964).

taken the position that computer programs were not within the statutory definition of patentable subject matter.[3]

The attached Brief Amicus Curiae deals with the need for resolution by this Court of the basic question of the patentability of computer programs. This subject is not fully treated in the Government's petition.

Accordingly, the Information Industry Association respectfully requests that this Court grant leave to file the attached Brief Amicus Curiae.

Respectfully submitted,

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[3]*See* S. Doc No. 5, 90th Cong., 1st Sess. 21 (1967); Guidelines to Examination of Application for Patents on Computer Programs, 33 Fed. Reg. 15609 (October 22, 1968); Rescission of Guidelines to Examination of Patent Applications on Computer Programs, 34 Fed. Reg. 15724 (October 10, 1969).

APPENDIX A

INFORMATION INDUSTRY ASSOCIATION MEMBERSHIP LIST CORPORATE MEMBERS

ABC-CLIO, INC.
2010 Alameda Padre Serra
Santa Barbara, Cal. 93103

ARCATA NATIONAL CORP.
2750 Sand Hill Rd.
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ASPEN SYSTEMS CORP.
4615 Forbes Ave.
Pittsburgh, Pa. 15213

AUERBACH PUBLISHERS, INC.
121 N. Broad St.
Philadelphia, Pa. 19107

BELL & HOWELL MICRO-PHOTO DIV.
Drawer "E"
Wooster, Ohio 44691

CAHNERS PUBLISHING CO., INC.
270 St. Paul St.
Denver, Colorado 80206

C & S PUBLICATIONS, INC.
1900 Ave. of the Stars
Century City
Los Angeles, Cal. 90067

CCM INFORMATION CORP.
866 Third Ave.
New York, N.Y.

CENTER FOR POLITICAL RESEARCH
1730 M Street, N.W.
Washington, D.C. 20036

CONGRESSIONAL INFORMATION SERVICE
4720 Montgomery Lane
Washington, D.C. 20014

FROST AND SULLIVAN
106 Fulton St.
New York, N.Y. 10038

HERNER & CO.
2100 M Street, N.W.
Washington, D.C. 20036

HOLT, RINEHART AND WINSTON
383 Madison Avenue
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Rochester, New York 14603

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LEASCO INFORMATION PRODUCTS, INC.
4833 Rugby Avenue
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MCGRAW-HILL, INC.
330 West 42nd Street
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NATIONAL BUSINESS SERVICES, INC.
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IN THE SUPREME COURT OF THE UNITED STATES

No. 71-485

ROBERT GOTTSCHALK, Acting
Commissioner of Patents,

Petitioner,

v.

GARY R. BENSON and ARTHUR C. TABBOT,

Respondents.

ON PETITION FOR WRIT OF CERTIORARI TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS

BRIEF AMICUS CURIAE FOR THE INFORMATION INDUSTRY ASSOCIATION

QUESTION PRESENTED

Whether a computer program constitutes patentable subject matter under 35 U.S.C. §101.

Interest of the Information Industry Association

The Information Industry Association was organized in 1968. Its 42 voting and 11 nonvoting members are for-profit organizations concerned with information production, storage, retrieval, processing and distribution. They include many small, relatively young corporations offering

specialized services as well as larger publishing and communications firms. Their business products include, *inter alia*, publications such as indexes, abstracts, citation lists, mail order catalogs, parts lists, price lists, directories, and services such as file searches, searches of current publications, and exhibits or demonstrations for educational, promotional, or merchandising purposes. These businesses depend upon the use of computers to process, store and update information, to search for and retrieve particular pieces of information from all of the information stored, and to assemble and transmit information products from storage.

Computer programs are essential to nearly all of this work. The information industry has experienced rapid growth and great innovation in recent years. Many novel and extremely useful computer programs have been and are being developed within the industry or by suppliers for the use of the industry. The industry is vigorously competitive. The interest of the Information Industry Association is to express the great practical need in the business community for resolution by this Court of the basic question of the patentability of computer programs.

Reason for Granting the Writ

A DEFINITE ANSWER TO THE QUESTION OF THE PATENTABILITY OF COMPUTER PROGRAMS IS NEEDED TO PROVIDE THE BUSINESS COMMUNITY MORE CERTAINTY IN ITS TRANSACTIONS WHICH INVOLVE AND DEPEND ON THE PROPRIETARY STATUS OF COMPUTER PROGRAMS

Section 101 of Title 35 limits patentable subject matter to "any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof." Respondents assert, and the Court of Customs and Patent Appeals decided, that a computer program is patentable subject matter because it falls within the definition of "process."

The question of the patentability of computer programs is relatively new and has not been settled by this Court. Until October, 1969, the Patent Office followed a policy of rejecting applications for patents on computer programs on the ground that they were not within the categories of patentable subject matter set out in the statute.[1] These rejections brought a series of eight cases on appeal to the Court of Customs and Patent Appeals.[2] Only the *In re Benson* case below considered the question of the patentability of a computer program with no accompanying hardware or machinery that reflected the invention. In 1970, in response to the Court of Customs and Patent Appeals decisions, the Patent Office began issuing patents on computer programs. However this is such a recent development that no infringement litigation has been commenced, of which *amicus curiae* is aware, and no federal district court or circuit court of appeals has decided this question.

In view of the wide variety of approaches being taken within the information industry and the business community generally to the question of proprietary protection for computer programs, the question raised by this case is certain to arise again and again until it reaches this Court. Until the basic question of patentability for computer programs is settled by this Court, the creators and users of computer programs face uncertainty surrounding the proprietary status

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[1] *See* S. Doc. No. 5, 90th Cong., 1st Sess. 21 (1967); Guidelines to Examination of Application for Patents on Computer Programs, 33 Fed. Reg. 15609 (October 22, 1968); Rescission of Guidelines to Examination of Patent Applications on Computer Programs, 34 Fed. Reg. 15624 (October 10, 1969)

[2] The cases decided prior to this case are: *In re Prater*, 415 F.2d 1378 (C.C.P.A. 1968), *mod on reh.* 415 F.2d 1393 (C.C.P.A. 1969); *In re Wheeling*, 413 F.2d 1187 (C.C.P.A. 1969); *In re Bernhart*, 417 F.2d 1395 (C.C.P.A. 1969); *In re Musgrave*, 431 F.2d 882 (C.C.P.A. 1970); *In re Mahony*, 421 F.2d 742 (C.C.P.A. 1970); *In re Foster*, 438 F.2d 1011 (C.C.P.A. 1971); *In re Benson*, 441 F.2d 682 (C.C.P.A. 1971); *In re McIlroy*, 442 F.2d 1397 (C.C.P.A. 1971)

of computer programs. Uncertainty in this area is undesireable and has an adverse effect on business. Uncertainty inhibits investment in research and development of new products. Uncertainty unduly complicates the marketing of existing products by requiring the parties to a transaction to rely on several alternative, duplicative and coincident proprietary mechanisms. Uncertainty thereby unduly raises the cost of the product to the user. This is a major issue affecting not only the information industry but a major portion of the business community and is deserving of the immediate and detailed attention, presentations and argument it would receive in this case Further, since the Patent Office has begun issuing patents to computer programs, this is likely to be the only opportunity for the Court to consider the broad question of patentability for computer programs. The alternative for the business community is to await piecemeal decisions in other cases arising out of patent litigation between private parties involving more limited questions affecting directly only those private parties. A determination now would provide the business community with more certainty not only with regard to contractual relations in each computer program situation, but also in deciding upon its overall business approach to computer software, its production, marketing and use.

The Government's Petition cites *Graham v. John Deere Co.*, 383 U.S. 1, 18 (1966) to the effect that the resolution of such a major issue through case by case litigation debilitates the patent system. In the view of the information industry, to await litigation on this issue is to debilitate commerce in this major field of human endeavor.

CONCLUSION

The Information Industry Association urges that certiorari be granted.

Respectfully submitted,

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IN THE

Supreme Court of the United States

OCTOBER TERM 1971

No. 71-485

ROBERT GOTTSCHALK, ACTING COMMISSIONER OF PATENTS,
Petitioner,

v.

GARY R. BENSON and ARTHUR C. TABBOT,
Respondents.

On Petition for Writ of Certiorari to the United States Court of Customs and Patent Appeals

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MOTION FOR LEAVE TO FILE BRIEF AMICUS CURIAE

International Business Machines Corporation (IBM) respectfully moves for leave to file the attached Brief Amicus Curiae in the above-entitled case. Petitioner has consented to the filing of this Brief. Counsel for respondents has not consented.

IBM is a corporation organized in 1924 under the laws of the State of New York. Its principal business is the manufacture and sale of a wide range of general purpose computers and various associated peripheral equipment. IBM supplies various services to computer users and creates and markets computer programs. IBM also manu-

factures office equipment such as typewriters, dictation equipment, copying equipment and related supplies.

IBM employs over 10,000 computer programmers and included in that number are many of the more than 7,000 mathematicians employed by IBM. Innovative computer programming is of particular importance to a computer manufacturer like IBM because it increases the utility of computers. Research in the use of mathematical or computational techniques is also of great importance to computer manufacturers because many significant uses of computers, for example, in space exploration, derive from breakthroughs in mathematics that most practically can be performed with the aid of a computer.

The attached Brief Amicus Curiae deals with three aspects of the question presented in this case that are not fully treated in the Government's Petition: first, the consistent rejection by the Court of Customs and Patent Appeals of Patent Office efforts to follow rules of law declared in prior decisions of this Court; second, the rejection of patent protection for computer programs by other countries; and third, the availability of copyright protection and current legislative consideration of other forms of protection for proprietary rights in computer programs.

Accordingly, IBM respectfully requests that this Court grant leave to file the attached Brief Amicus Curiae.

Respectfully submitted,

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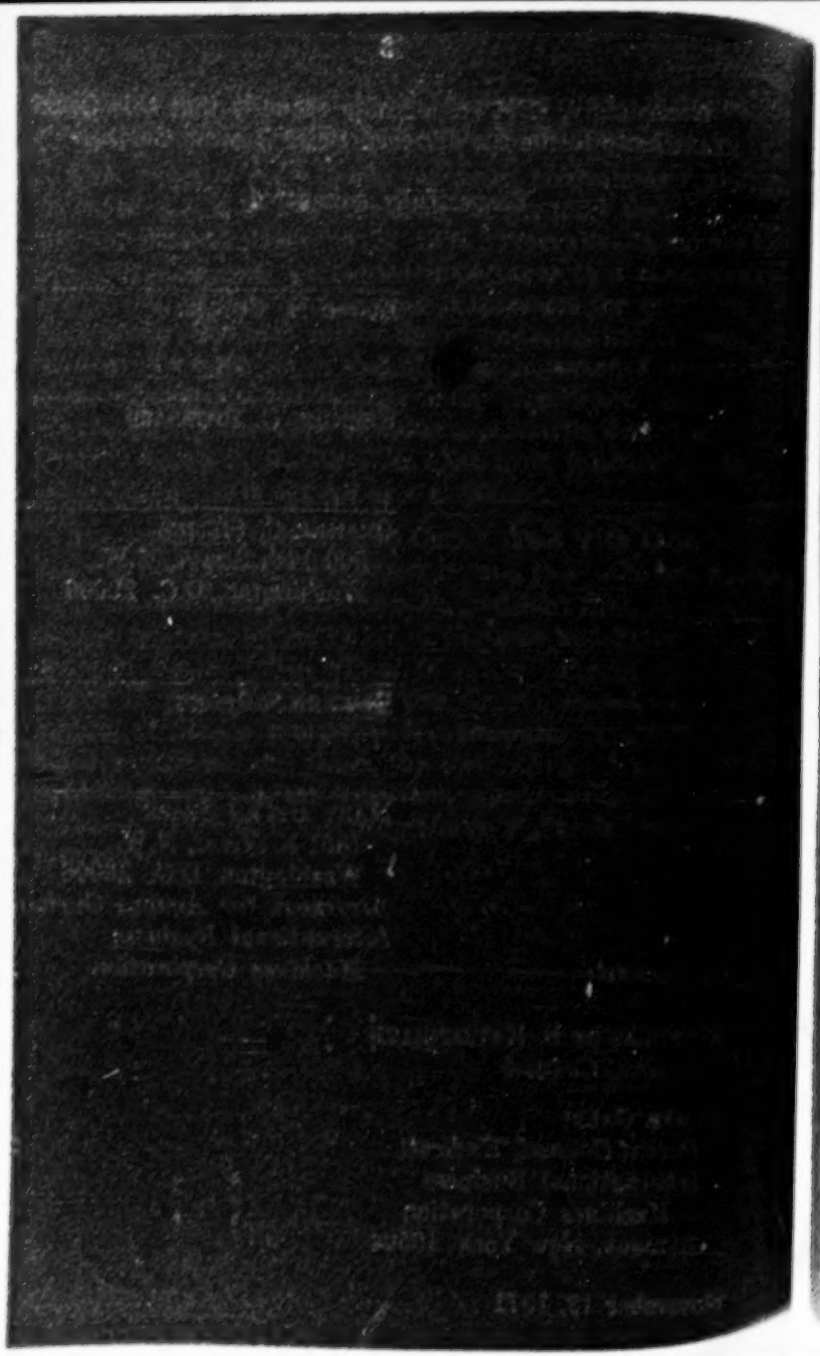

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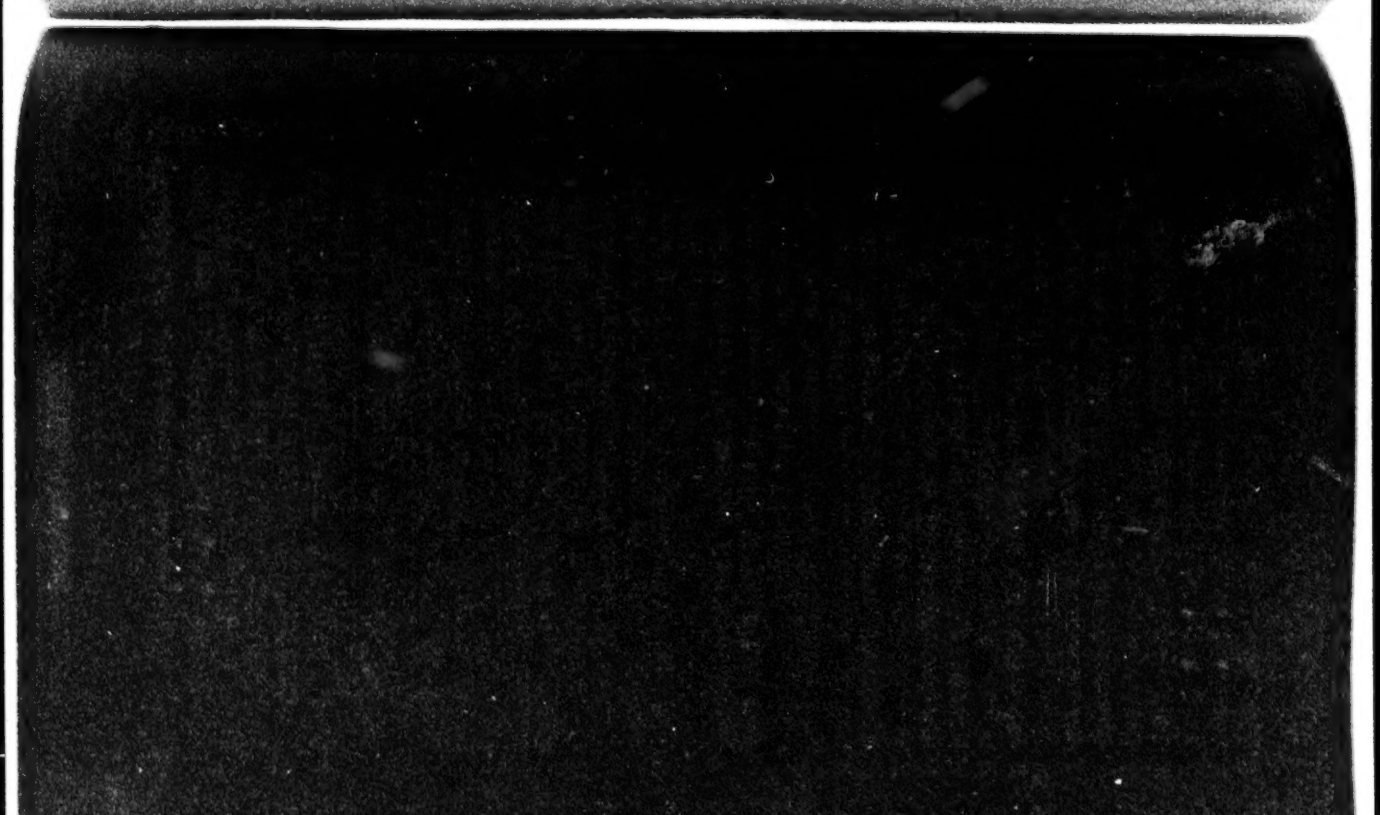

IN THE

Supreme Court of the United States

OCTOBER TERM 1971

No. 71-48[illegible]

ROBERT GOTTSCHALK, ACTING COMMISSIONER OF PATENTS,
Petitioner,

v.

GARY R. BENSON and ARTHUR C. TABBOT,
Respondents.

On Petition for Writ of Certiorari to the United States Court of Customs and Patent Appeals

BRIEF AMICUS CURIAE FOR INTERNATIONAL BUSINESS MACHINES CORPORATION

Questions Presented

1. Whether this Court should exercise its supervisory jurisdiction to resolve the conflict between the Patent Office and the Court of Customs and Patent Appeals as to the standards of patentability applicable to process claims.

2. Whether a novel method of arithmetical calculation that normally, but not necessarily, is performed by an old computer is a patentable process.

Interest of Amicus Curiae

IBM is a corporation organized in 1924 under the laws of the State of New York. Its principal business is the manufacture and sale of a wide range of general pur-

ose computers and various associated peripheral equipment. IBM supplies various services to computer users and creates and markets computer programs. IBM also manufactures office equipment such as typewriters, dictation equipment, copying equipment and related supplies.

IBM employs over 10,000 computer programmers and included in that number are many of the more than 7,000 mathematicians employed by IBM. Innovative computer programming is of particular importance to a computer manufacturer like IBM because it increases the utility of computers. Research in the use of mathematical or computational techniques is also of great importance to computer manufacturers because many significant uses of computers, for example, in space exploration, derive from breakthroughs in mathematics that most practically can be performed with the aid of a computer.

The interest of amicus curiae is to deal with three aspects of the question presented in this case that are not fully treated in the Government's Petition: first, the consistent rejection by the Court of Customs and Patent Appeals of Patent Office efforts to follow rules of law declared in prior decisions of this Court; second, the rejection of patent protection for computer programs by other countries; and third, the availability of copyright protection and current legislative consideration of other forms of protection for proprietary rights in computer programs.

Reasons for Granting the Writ

1. THE COURT BELOW HAS PERSISTENTLY IMPOSED UPON THE PATENT OFFICE AN IMPROPER STANDARD OF PATENTABILITY WITH RESPECT TO COMPUTER PROGRAMS

It is clear from the record in this case that the invention for which a patent is sought is a mathematical algorithm that may be embodied in a computer program.

It is a method, recipe, or set of rules that can be used for solving a problem with the aid of a general purpose digital computer.[1] Respondents claimed their invention was a patentable process.

The patentability of a process is governed by the standard this Court enunciated in *Cochrane* v. *Deener*, 94 U.S. 780 (1876). That standard includes a universally recognized prohibition against the patenting of mathematical techniques, scientific principles and other abstract concepts or rules."[2] *Le Roy* v. *Tatham*, 55 U.S. (17 How.) 155, 174 (1852); *O'Reilly* v. *Morse*, 56 U.S. (15 How.) 62, 112-19 (1853); *Mackay Radio & Telegraph Co.* v. *Radio Corp. of America*, 306 U.S. 86, 94 (1939); *see also The Telephone Cases*, 126 U.S. 1, 534 (1888); *DeForest Radio Co.* v. *General Electric Co.*, 283

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[1] The Benson and Tabbot patent application states at the outset:

> "This invention relates to the processing of data by program and more particularly to the programmed conversion of numerical information." Record before the Court of Customs and Patent Appeals (hereinafter "Record") at 8.

The Patent Office Board of Appeals found:

> ". . . that claim 13 is so broad as to read on the mental activity alone of a mathematician while carrying out a set of rules or, more precisely, an algorithm, that expresses a relation of one arbitrary system of symbolizing an abstract number to another system for symbolizing the same abstract number. There is no physical act on a physical thing suggested by this claim and it is merely the definition of a mathematical algorithm. Record at 139; Petition for Certiorari, *Gottschalk* v. *Benson et al*, No. 71-485, Appendix D, at 39 (hereinafter "Petition").

[2] This principle has been emphasized by every major treatise on patent law. *See, e.g.*, PHILLIPS, THE LAW OF PATENTS FOR INVENTIONS 109-110 (1837); CURTIS, A TREATISE ON THE LAW OF PATENTS FOR USEFUL INVENTIONS IN THE UNITED STATES OF AMERICA 56-7 (1st ed. 1849); THE AMERICAN LAW REGISTER 129, 143 (Jan. 1868); 1 ROBINSON, THE LAW OF PATENTS FOR USEFUL INVENTIONS 190-91 (1890); 1 WALKER ON PATENTS 186-47 (Deller 2d ed. 1964).

U.S. 664, 684-85 (1931); *Funk Brothers Seed Co.* v. *Kalo Inoculant Co.*, 333 U.S. 127, 130 (1948).

The Patent Office applied the Supreme Court standard referred to above and rejected the respondents' patent application because the process described was simply a method of manipulating mathematical symbols. Record at 140; Petition, App. D, at 40. The Court of Customs and Patent Appeals reversed, declaring that the standard of patentability used by the Patent Office was inapplicable and no longer the law.

The decision below is the culmination of a series of cases in which the Patent Office and the Court of Customs and Patent Appeals (hereinafter "CCPA") have been at loggerheads over whether a broad range of new methods that fall under the general rubric of computer programs constitute patentable subject matter. The Patent Office has been castigated for "refusing to follow what this reviewing court [the CCPA] has now declared the law to be. . . ." *Application of Prater*, 415 F.2d 1378, 1390 (C.C.P.A. 1968, Rich, J. dissenting from grant of rehearing). The situation is distinctly parallel to the running dispute between the Patent Office and the CCPA as to the proper standard to be applied in assessing utility that caused this Court to grant certiorari in *Brenner* v. *Manson*, 383 U.S. 519, 522 (1966).[8]

This Court should exercise its supervisory jurisdiction and review the decision below because the decision below directly contradicts prior decisions of this Court and

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[8] In *Brenner*, the Court recognized a clear conflict between the Patent Office and the CCPA and an arguable conflict between the CCPA and the Court of Appeals for the District of Columbia, 383 U.S. at 522, n. 4. Here the conflict between Patent Office and CCPA is equally clear and there is again, at least arguably, a conflict with the Court of Appeals for the District of Columbia. *See Lyman* v. *Ladd*, 347 F.2d 423 (D.C. Cir. 1964).

requires the Patent Office to issue patents contrary to those decisions.[4]

The full sweep of the departure from prior decisions of this Court is apparent from a brief examination of the line of cases of which this case is one. The cumulative result of these decisions is clearly inconsistent with the constitutional standard of promoting progress in the useful arts.

The first case was *Application of Prater*, 415 F.2d 1378 (C.C.P.A. 1968) (hereinafter *"Prater I"*), in which the CCPA enunciated a sweeping change and embraced the patentability of claims containing so-called mental steps. Effectively repudiated were the CCPA's own prior and conflicting decisions in *In re Abrams*, 188 F.2d 165 (C.C.P.A. 1951), and *Application of Shao Wen Yuan*, 188 F.2d 377 (C.C.P.A. 1951), each of which relied upon this Court's decision in *Cochrane* v. *Deener*, 94 U.S. 780 (1876).

The mental steps doctrine, although sometimes difficult to apply, had long been in effect as a major practical application of the prohibition against the patenting of mathematical techniques, scientific principles, and other abstract concepts or rules. Its demise was, therefore, of great significance. The Patent Office sought, and was granted, a rehearing.[5] The decision on rehearing, *Application of Prater*, 415 F.2d 1393 (C.C.P.A. 1969) (hereinafter *"Prater II"*), did not disavow the principles enunciated in *Prater I*, but found unpatentable, on grounds of undue breadth, the process claims allowed in *Prater I*.

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[4] Under 35 U.S.C. §§ 141-144, the CCPA exercises binding appellate jurisdiction over the Patent Office. For this reason the Patent Office Guidelines for Examination of Patent Applications on Computer Programs, 33 Fed. Reg. 15609 (1968), which enunciated a blanket policy of denying patents for computer programs, were rescinded, 34 Fed. Reg. 15724 (1969), in light of the decision in *Application of Prater*, 415 F.2d 1393 (C.C.P.A. 1969).

[5] A lengthy dissenting opinion further illuminates the character of the running dispute between the Patent Office and the CCPA. 415 F.2d at 1390.

In its next computer program case, *Application of Bernhart*, 417 F.2d 1395 (C.C.P.A. 1969), the CCPA paid lip service to the inescapable fact "that in enacting section 101 Congress meant to exclude principles or laws of nature and mathematics . . . from even temporary monopolization by patent," 417 F.2d at 1399, but nonetheless found patentable certain claims drawn to the admittedly known combination of (1) a computer, (2) a plotter, and (3) a computer program. The sole novelty involved was the allegedly new set of mathematical equations contained in the computer program. The Patent Office had properly held the programmed computer-plotting device unit to be unpatentable under the doctrine of "old combination" which precludes repatenting the whole combination when an element is improved. The court below acknowledged that this doctrine has the support of many cases,[6] but pronounced the doctrine "unsound" in several respects. 417 F.2d at 1402. The CCPA held that the proper test was that enunciated in Section 112[7] which requires that claims specifically point out and distinctly claim the invention. On this basis the CCPA held the Patent Office rejection to be erroneous because "we do not see . . . how any of the claims would be made more particular or distinct by eliminating the

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[6] Citing this Court's decision in *Lincoln Engineering Co.* v. *Stewart-Warner Corp.*, 303 U.S. 545 (1938). 417 F.2d at 1402. *See also Heald* v. *Rice*, 104 U.S. 737 (1881); *Deering* v. *Winona Harvester Works*, 155 U.S. 286 (1894); *Bassick Manufacturing Co.* v. *R. M. Hollingshead Co.*, 298 U.S. 415 (1936); and, with specific reference to the Patent Act of 1952, *Anderson's-Black Rock, Inc.* v. *Pavement Salvage Co.*, 396 U.S. 57 (1969).

[7] As this Court indicated in *Anderson's-Black Rock, Inc.* v. *Pavement Salvage Co.*, 396 U.S. 57 (1969), the statutory basis actually is found in Section 103.

Proper consideration of the old combination doctrine under Section 103 would have required the CCPA to focus on the differences between the claimed subject matter and the prior art, and to acknowledge that the sole novelty lay in the computer program. Patentability could then be found only by borrowing invention from the mathematical equations in derogation of *Funk Brothers Seed Co.* v. *Kalo Inoculant Co.*, 333 U.S. 127, 132 (1948).

plotting machine limitation from the body of the claim." 417 F.2d at 1403. Glossed over was the fact, fatal to allowability of the claims, that elimination of the plotting machine limitation would have reduced the claim to a further "old combination" of a computer with a program, from which elimination of the old computer would strip the claim to its single novel feature, the recitation of a set of mathematical equations which the CCPA had acknowledged Congress meant to exclude from patent protection.[8]

In *Application of Mahony*, 421 F.2d 742 (C.C.P.A. 1970), the CCPA reversed a Patent Office rejection that was premised upon the position "that where a claim reads on both statutory and nonstatutory subject matter [under 35 U.S.C. 101] it could not be in compliance with the second paragraph of section 112." The CCPA simply stated, "[w]ith this view we disagree." 421 F.2d at 745. No attempt was made to rationalize prior inconsistent decisions of this or any other court, including *Funk Brothers Seed Co.* v. *Kalo Inoculant Co.*, 333 U.S. 127 (1948), and *Lyman* v. *Ladd*, 347 F.2d 482 (D.C. Cir. 1965).

In *Application of Musgrave*, 431 F.2d 882 (C.C.P.A. 1970), the court below not only reaffirmed *Prater I*, but, relying upon its own rejection of the doctrine of aggregation,[9] expanded its holding to the point that "[a]ll

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[8] *Cf. Lyman* v. *Ladd*, 347 F.2d 482 (D.C. Cir. 1965), where a "mathematical apportionment" of old structural elements was held unpatentable.

[9] The CCPA rejected the aggregation doctrine in *Application of Gustafson*, 331 F.2d 905 (C.C.P.A. 1964).

This Court has applied the aggregation doctrine in an unbroken line of cases extending from *Hailes* v. *Van Wormer*, 87 U.S. (20 Wall.) 353 (1873); through *Reckendorfer* v. *Faber*, 92 U.S. 347 (1875); *Pickering* v. *McCullough*, 104 U.S. 310 (1881); *Richards* v. *Chase Elevator Co.*, 158 U.S. 299 (1895); *Great Atl. & Pac. Tea Co.* v. *Supermarket Equipment Corp.*, 340 U.S. 147 (1950); to *Anderson's-Black Rock, Inc.* v. *Pavement Salvage Co.*, 396 U.S. 57 (1969).

The Patent Office, bound by the CCPA decision, has now discarded the doctrine. *See Ex parte Held*, 146 U.S.P.Q. 553 (Pat. Off. Bd. App. 1965).

that is necessary . . . to make a sequence of operational steps a statutory 'process' within 35 U.S.C. 101 is that it be in the technological arts. . . ." 431 F.2d at 893. As the concurring opinion observed, "one no longer need disclose apparatus for carrying out his process." 431 F.2d at 894.

Once more, in *Application of Foster*, 438 F.2d 1011 (C.C.P.A. 1971), the Patent Office attempted, without success, to stem the onslaught of computer program patent claims. Reaffirming *Musgrave* and its antecedents, the CCPA also rejected still another rule repeatedly enunciated by this Court, that a process constituting merely the inherent function of a machine is *per se* unpatentable.[10] This was necessary in order to hold patentable the process claims defining the use of an old computer to perform its intended function with a specific new program.

In this case, *Application of Benson*, 441 F.2d 682 (C.C.P.A. 1971), the CCPA followed its own new rules of law as enunciated in the cases discussed above and applied what was termed a standard of reasonableness

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[10] The rule is articulated in *Corning* v. *Burden*, 56 U.S. (15 How.) 252, 268 (1853); *Risdon Iron and Locomotive Works* v. *Medart*, 158 U.S. 68, 72 (1895); *Westinghouse* v. *Boyden Power Brake Co.*, 170 U.S. 537, 554-57 (1898); *Busch* v. *Jones*, 184 U.S. 598, 607 (1902); *Expanded Metal Co.* v. *Bradford*, 214 U.S. 366, 383 (1909).

The CCPA first squarely rejected this rule in *Application of Tarczy-Hornoch*, 397 F.2d 856 (C.C.P.A. 1968), and dismissed all of this precedent as "the product of an essentially illogical distinction unwarranted by, and at odds with, the basic purposes of the patent system and productive of a range of undesirable results from the harshly inequitable to the silly." 397 F.2d at 867. In view of *Tarczy-Hornoch*, the Manual of Patent Examining of Procedure § 706.03(r) has been revised by the Patent Office to eliminate rejections of process claims based on mere function of machine grounds.

to the interpretation of respondents' claims.[11] As the court below stated, "given the meaning they would have to one of ordinary skill in the pertinent art when read in the light of and consistently with the specification" each of respondents' claims was primarily concerned with a machine-implemented process rather than a mentally implemented one. 441 F.2d at 687.

However, any inference that machine implementation is a desideratum—or even a factor—in assessing patentability of computer program claims was squarely denied in *Application of McIlroy*, 442 F.2d 1397 (C.C.P.A. 1971), decided just three weeks after the *Benson* decision. There the CCPA came full circle and, abandoning all inference that *Prater I* may have overreached in this regard, candidly asserted that "machine implementation versus mental implementation is *not* a determinative dichotomy" in assessing patentability. 442 F.2d at 1398 (emphasis added).

As a result of these decisions the Patent Office is now obligated to grant claims which recite as their sole novel feature mathematical techniques, scientific principles and other abstract concepts or rules.

This result is inconsistent with the patent clause of the Constitution which grants the Congress only a qualified authority limited to promoting advances in science and the useful arts. *Graham* v. *John Deere Co.*, 383 U.S. 1, 5-6 (1966). It was early recognized that "if a patent could be taken for a newly discovered principle in science, it would cover every object to which the principle could be applied. . . ." CURTIS, A TREATISE ON THE

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[11] This standard was utilized, in effect, to narrow the claim to the computer-implemented process exemplified in the specification, *contra* the decisions of this Court. *E.g.*, *White* v. *Dunbar*, 119 U.S. 47 (1886); *The Incandescent Lamp Patent*, 159 U.S. 465 (1895); *General Electric Co.* v. *Wabash Appliance Corp.*, 304 U.S. 364 (1938); *Halliburton Oil Well Cementing Co.* v. *Walker*, 329 U.S. 1 (1946).

LAW OF PATENTS FOR USEFUL INVENTIONS IN THE UNITED STATES OF AMERICA 62-63 (1st ed. 1849). This would not promote advances in the useful arts and this Court has consistently so held. *O'Reilly* v. *Morse*, 56 U.S. (15 How.) 52 (1853); *The Telephone Cases*, 126 U.S. 1 (1888); *DeForest Radio Co.* v. *General Electric Co.*, 283 U.S. 664 (1931); *Mackay Radio & Telegraph Co.* v. *Radio Corp. of America*, 306 U.S. 86 (1939); *Funk Brothers Seed Co.* v. *Kalo Inoculant Co.*, 333 U.S. 127 (1948).

The prohibition against patenting abstract principles necessarily limits patentability to processes involving a mode of treatment of physical materials to obtain a different state or thing—thus precluding the patenting, under the guise of processes, of purely intellectual discoveries such as the exercise in mathematics defined by respondents' claims. As Robinson teaches

> "Every invention, when applied according to the design of its inventor, must accomplish some change in the character or condition of material objects. This is as essential in a patentable art as in an instrument. Hence a plan or theory of action which, if carried into practice, could produce no physical results proceeding directly from the operation of the theory or plan itself, is not an art within the meaning of the Patent Law, however greatly it may promote the comfort or the welfare of mankind. . . ." 1 ROBINSON, THE LAW OF PATENTS FOR USEFUL INVENTIONS 249-50 (1890).

This, of course, is the rationale of the definition of a patentable process enunciated in *Cochrane* v. *Deener*, 94 U.S. 780 (1876), from which this Court has never departed.[13] In 1951, the CCPA held that it was bound

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[13] *E.g.*, *New Process Fermentation Co.* v. *Maus*, 122 U.S. 413, 427-28 (1887); *The Telephone Cases*, 126 U.S. 1, 533 (1888); *Fond Du Lac County* v. *May*, 137 U.S. 395, 407 (1890); *Risdon Iron and Locomotive Works* v. *Medart*, 158 U.S. 68, 75 (1895); *Expanded Metal Co.* v. *Bradford*, 214 U.S. 366, 383-84 (1909).

by the rule in *Cochrane*. *Application of Shao Wen Yuan*, 188 F.2d 377, 382 (C.C.P.A. 1951). However, in 1968 and thereafter, the CCPA characterized that rule as mere dictum. *Application of Prater*, 415 F.2d 1378, 1387-88 (C.C.P.A. 1968); *Application of Musgrave*, 431 F.2d 882, 893 (C.C.P.A. 1970).

If the rule in *Cochrane* had been followed by the CCPA, as it was by the Patent Office, none of the patents in the line of cases beginning with *Prater* and ending with *McIlroy* would have been allowed. The CCPA, in conflict with every relevant decision of this Court, has repudiated its own prior decisions to issue a series of rulings, including the decision below, which decree that claims covering abstract mathematical or scientific principles are patentable; that the originator of an abstract principle may obtain a patent covering the principle *per se* without limitation to such practical application thereof as his specification may disclose; and that patentability is imparted to any abstract principle by defining it as a "process" utilized in a computer program. It is for this reason that the Court should review the decision in this case.

2. THE PRACTICE IN OTHER COUNTRIES IS TO DENY PATENT PROTECTION FOR COMPUTER PROGRAMS

The question of the patentability of advances in computer programming has been raised in at least nine other countries, either with respect to specific legislative proposals or decisions under existing law as to applications for patents on computer programs. Although when the question first arose, some countries did issue patents directed to computer programs,[12] most countries now re-

[12] For example, a patent on the computer program at issue in this case was issued by the Patent Office of Canada, Patent No. 732763, on April 19, 1966. This was prior to the issuance of the guidelines referred to below, p. 12.

fuse to grant patent protection for computer programs. In France there is a recently enacted direct statutory prohibition on patents for computer programs.[14] The United Kingdom currently has no such direct statutory prohibition, but the Committee to Examine the Patent System and Patent Law last year strongly recommended adoption of such a provision.[15]

As noted in the Government's Petition, p. 12, n. 3, the Canadian Patent Office has issued administrative instructions that computer programs are not patentable subject matter.[16] Similarly, the Japanese Patent Office has a regular practice of rejecting patent applications directed to computer programs. Japanese Patent Office, Current

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[14] Article 7 of the French Patent Law provides:

"Any invention is considered industrial which in its object, its application and its result, whether achieved by human intervention or by machine, cooperates in the production of goods or technical results. Not considered as industrial inventions, are, in particular: (1) Theoretical, or purely scientific principles, discoveries or concepts; . . . (3) Financial or accounting methods, rules or games, or all other systems of an abstract character and, in particular, the programs or series of instructions used for promoting the operation of a computer." Patent Law of January 2, 1968, art. 7. (An English translation appears in INDUSTRIAL PROPERTY 67-75 (BIRPI, Geneva, Switz., March, 1968).

[15] The Committee's report devoted a full chapter to the protection of computer programs and stated:

"a computer program that is: a set of instructions for controlling the sequence of operations of a data processing system, in whatever form the invention is presented e.g. a method of programming computers, a computer when programmed in a certain way and where the novelty or alleged novelty lies only in the program; should not be patentable." The British Patent System, Report of the Committee to Examine the Patent System and Patent Law, Cmnd. No. 4407, at 144 (July, 1970).

[16] *See also* Economic Council of Canada, Report on Intellectual and Industrial Property (January 1971), which formulated patent policy recommendations and stated: "We conclude, therefore, that patent protection of computer programs would not be appropriate in Canada at the present time." Report at 103.

Situation and Problems Arising from Patent Protection of Software (report submitted to MITI Legal Study Committee, July 2, 1971).

In Australia,[17] Austria,[18] The Netherlands,[19] and Switzerland,[20] Patent Office appellate proceedings have resulted in decisions declaring that computer programs are not patentable subject matter.

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[17] Australia: In three cases appealed from rejections by the examiners, the Australian Patent Office has uniformly held program inventions to be not patentable. *N. V. Phillips*, 36 Official Journal of Patents, Trademarks and Designs 2892 (1966); *Application of Texas Instruments*, 38 Official Journal of Patents, Trademarks and Designs 2846 (1968). *Application of British Petroleum, Ltd.*, 38 Official Journal of Patents, Trademarks and Designs 1020 (1968).

[18] Austria: The Appeal Senate of the Austrian Patent Office recently held that computer programs are not patentable, B32/70 (A125/67), October 29, 1970, and stated:

> "Protection extending solely to computing rules is not practicable, for . . . scientific rules and principles as such were expressly excluded from patent protection."

See also nullity proceeding against Austrian Patent No. 238,978 owned by the British Petroleum Company, Ltd., 11 Patent Gazette 186 (1968).

[19] Netherlands: A recent decision of the Patent Office Board of Appeals, on December 16, 1970, held that computer programs are not patentable under the Netherlands Patent Act and stated:

> "The programming of the device according to the invention, the so-called software, is, indeed, founded on a meritorious idea, but the implementation thereof is unpatentable either as a device or as a process." BIE No. 2, February 15, 1971.

[20] Switzerland: Computer programming inventions are currently considered unpatentable in Switzerland as the result of a Swiss Patent Office decision of September 3, 1968 rejecting an application with claims to a computer program. The application related to a procedure for the design of construction reinforcements by programming the calculation for design on a known computer. In reaching its decision the Patent Office stated that the design of a computer program is not an achievement which uses the means of natural forces or which influences natural forces to achieve a "technical result" but rather a purely mental effort for which patent protection is not available. Patent Muster Und Markenblatt 68-1-53.

Although the question is not settled in Germany, a recent commentary would make it appear that programs are not patentable in Germany.[21]

One of the principal objectives identified by the President's Commission on the Patent System was "[t]o make U.S. patent practice more compatible with that of other major countries, wherever consistent with the objectives of the U.S. patent system." To Promote the Progress of the Useful Arts, Report of the President's Commission on the Patent System at 4 (1966). The Commission found that denying patent protection to computer programs was completely consistent with the objectives of the patent system because

> "the creation of programs has undergone substantial and satisfactory growth in the absence of patent protection and . . . copyright protection for programs is presently available." Report at 13.

Therefore, it is submitted that great weight should be given to the practice in other countries, which is to deny patent protection for computer programs.

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[21] Germany: KRAUSSE, KATHLUN, & LINDENMAIER, DAS PATENTGESETZ (The Patent Act) at 9 (5th ed. 1970) states:

> "In accordance with the opinion generally advanced in German literature, programs for controlling electrical data processors are not patentable. Such processors operate to a program consisting of a sequence of instructions relating to the actual intellectual achievement. Programs do not solve circuit problems but are dependent upon a particular algorithm . . . . The input of the program, that means its storage, which is effected by means of paper, tapes, punched cards or magnetic tapes, does not alter the fact that the program is merely an instruction for operating the machine, by means of which the stored material is to be checked and processed. It does not constitute, however, a teaching for technical action."

3. ANY NEW FORM OF PROTECTION FOR COMPUTER PROGRAMS SHOULD BE ACCOMPLISHED BY LEGISLATION, NOT BY JUDICIAL EXPANSION OF THE PRESENT PATENT SYSTEM

Amicus curiae does not contend that the proprietary rights in computer programs should be without protection. Indeed, in the long run, the maintenance of the necessary incentives to development of new programs may well require some limited form of protection against unauthorized copying or use. Amicus curiae does contend, however, that the current patent statute is an inappropriate and Congressionally unintended means of protection, which cannot and should not be extended by judicial decision to meet this need.

In this connection it is important that copyright protection is available for computer programs and many authors of programs have taken advantage of this form of protection.[22] Copyright achieves the basic purpose of preventing one who has made no investment of time or money in creating a computer program from appropriating the program by copying it. However, it does not prevent the legitimate creator of computer programs from independently arriving at the same result by making his own investment of the required time and effort.

It is also significant that general revision of the patent laws has been under active consideration by the Congress since the report of the President's Commission on the Patent System was issued in 1966 [23] and the question of

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[22] Copyright Office, Library of Congress, Circular 31 D (April, 1967); Breyer, *The Uneasy Case for Copyright: A Study of Copyright in Books, Photocopies, and Computer Programs*, 84 HARV. L. REV. 281 (1970).

[23] Nine bills were introduced during the 90th Congress: S. 1042, 90th Cong., 1st Sess. (1967); S. 1691, 90th Cong., 1st Sess. (1967); S. 2164, 90th Cong., 1st Sess. (1967); S. 2597, 90th Cong., 1st Sess. (1967); S. 3892, 90th Cong., 2d Sess. (1968); H.R. 5924, 90th

the patentability of computer programs has been directly addressed. Moreover, several proposals have been made for legislation to create a special and limited form of protection tailored to the computer programming industry.[24]

Whatever form of protection of proprietary rights is to be extended to computer programs should be done by Congress, after full consideration of this new and flourishing field, not by a Congressionally unintended expansion of the patent system.

Cong., 1st Sess. (1967); H.R. 7454, 90th Cong., 1st Sess. (1967); H.R. 10006, 90th Cong., 1st Sess. (1967); H.R. 11447, 90th Cong., 1st Sess. (1967).

Four bills were introduced during the 91st Congress: S. 1246, 91st Cong., 1st Sess. (1969); S. 1569, 91st Cong., 1st Sess. (1969); S. 2756, 91st Cong., 2d Sess. (1970); H.R. 12280, 91st Cong., 1st Sess. (1969).

Two of the bills introduced in the 90th and 91st Congresses were reintroduced in the 92d Congress. S. 643, 92d Cong., 1st Sess. (1971); H.R. 4012, 92d Cong., 1st Sess. (1971). Hearings were held on S. 643 on May 11, 1971. CCH Congressional Index, 92d Congress, p. 2505 (1971).

[24] *See generally*, Goldberg, EDP Software Protection—Present and Future, 1970 Management Conference and Annual Meeting, Assoc. of Data Processing Service Organizations, Inc. (October 15, 1970); 1969 Proceedings, Law of Software Conference, Computers-In-Law Institute, National Law Center, George Washington University.

CONCLUSION

For the reasons stated above, amicus curiae urges that certiorari be granted and that the decision of the Court of Customs and Patent Appeals be reversed.

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E. ROBERT SEAVER

IN THE

Supreme Court of the United States

OCTOBER TERM, 1971

ROBERT GOTTSCHALK, Acting Commissioner of Patents,
Petitioner,

v.

GARY R. BENSON AND ARTHUR O. TABBOT, *Respondents*.

ON PETITION FOR A WRIT OF CERTIORARI TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS

BRIEF FOR RESPONDENTS IN OPPOSITION

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December 7, 1971

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ON PETITION FOR A WRIT OF CERTIORARI TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS

BRIEF FOR RESPONDENTS IN OPPOSITION

QUESTION PRESENTED

Whether respondents' claimed process of converting electrical signals by machine is a "useful process" within the meaning of 35 U.S.C. § 101.

STATEMENT

Respondents filed a patent application disclosing a novel machine method for converting signals encoded in the binary coded decimal (BCD) notation into signals encoded in the ordinary binary notation. Although this process can be performed on most general purpose stored program computers, its practical use as the preferred method is far more limited. Respondents have incorporated their invention in a stored-program-controlled electronic telephone switch-

ing system for converting dial signals into binary signals, and it is in this particular equipment that the invention is most useful.

Many other machine processes for converting binary coded decimal signals to binary signals were known prior to respondents' invention, and have been and will continue to be used generally to perform this function. Respondents' specific contribution was in response to a need for less apparatus complexity, reduced memory requirements and faster conversion in certain types of computers. Respondents' invention achieved these objectives by providing a novel combination comprising a short and simple sequence of steps which could be performed iteratively.

The Patent Office rejected respondents' claims on the sole ground that they related to subject matter which was not embraced by 35 U.S.C. § 101. The court below unanimously reversed, holding that "a process having no practical value other than enhancing the internal operation of * * * [computer] machines is * * * in the technological or useful arts * * *." (Pet., p. 31)

ARGUMENT

The decision below is in full accord with established principles of law, conflicts with no decision of this or any other Court, and presents no appropriate occasion for the exercise of this Court's rarely utilized jurisdiction under 28 U.S.C. § 1256.

There is no dispute that respondents have invented a process that is both "new" and "useful." That process enables certain types of machines to be operated far more efficiently than was previously the case. This Court has consistently held that technological or industrial processes are patentable. *Smith* v. *Snow*, 294 U.S.

1 (artificial incubation); *Expanded Metal Co.* v. *Bradford,* 214 U.S. 366 (mechanical metal forming); *Tilghman* v. *Proctor,* 102 U.S. 707 (fat treatment); *Cochrane* v. *Deener,* 94 U.S. 780 (flour processing).[1] Technological processes which, like respondents' processes, rely on acts performed on electrical signals have likewise consistently been held by this Court to constitute statutory subject matter. *The Telephone Cases,* 126 U.S. 1 (telephony); *O'Reilly* v. *Morse,* 15 How. 62 (telegraphy).

The suggestion that the decision of the court below results in the allowance of a patent on "mathematical theories and mental steps" (Pet., p. 8) is basically fallacious. As the court below recognized, respondents' claims are directed to a particular sequence of machine steps, designed to accomplish a particular result.[2] In respondents' invention these steps are performed on electrical signals when certain coded instructions are executed. The process is no more one of "mathematical theories and mental steps" than it would be if it were accomplished by use of specially designed wired circuitry (a permanent physical part of a machine), on which many patents have issued without challenge by petitioner. Indeed, it could be so accomplished, since it is well known that computer

[1] It may be noted that in each of the decisions of this Court cited in the Petition (at p. 9) for the proposition that scientific principles and the like are not patentable the Court recognized that statutory subject matter was in fact present, although not properly claimed in every case.

[2] The construction of the claims by the court below was commanded by Section 112 of the Patent Code, 35 U.S.C. § 112. This construction, tying the claims to machine implementation, has not been challenged by petitioner. Any such challenge would in any event have raised no issue appropriate for this Court's resolution.

or logic operations can be performed either with wired circuitry or programming. See Kovacic, *Programmed or Wired Logic—Which Is Best For Your Control?* 14 Control Engineering 120 (Jan. 1967). There is no basis in the patent statute or in case law for suggesting that a process involves statutory subject matter if performed by a permanently-wired-together electrical circuit but does not if, as here, it is performed by a programmed machine. The latter no more than the former can properly be characterized as consisting simply of "mathematical theories and mental steps." In both instances the process covers steps in the operation of a machine for the purpose of achieving a specific result.[8]

Petitioner's claim that the holding below conflicts with two decisions rendered by the Ninth Circuit some decades ago (Pet., pp. 11-12) is without merit. In both of the cited cases the heart of the claimed invention was a mathematical computation to be undertaken by human agency. Here, in contrast, respondents have expressly disclosed program-controlled apparatus for practicing each and every step of their invention, without any human intervention, and the court below has specifically interpreted the patent claims as entirely tied to the operation of machines.

The argument that the decision below will have a serious impact on the computer industry (Pet., p. 12) is

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[8] Cf. Cochrane v. Deener, 94 U.S. 780, 788: "A process is a mode of treatment of certain materials to produce a given result." Such "materials" include, as is the case here, electricity. The Telephone Cases, 126 U.S. 1. The effect of the *Cochrane* case is thus, contrary to petitioner's suggestion (Pet., pp. 10-11) "not to limit process patentability but to point out that a process is not limited to the means used in performing it." Application of Prater and Wei, 415 F.2d 1393, 1403 (C.C.P.A. 1969).

entitled to no weight. That argument could as readily be made with respect to the patentability of inventions in computer hardware, and indeed if accepted could be used to justify wide preclusion of patentability in any industry where inventive technology plays a significant role. There is no discernible reason why an inventor who can meet the stringent standards of patentability laid down by this Court in *Graham* v. *John Deere Co.*, 383 U.S. 1, should be deprived of his statutory rights here more than in any other circumstances.

Similarly, the suggestion that the Patent Office will be quite overwhelmed if this invention and others like it are allowed patentability (Pet., p. 14) is not worthy of serious consideration. The suggestion ignores the fact that in no event will more than a small fraction of new computer processes meet the rigorous tests of invention and a smaller fraction still are likely to be the subject of patent applications in view of economic and other practical restraints. And so far as any problem of searching the prior art is concerned, the Patent Office will in any event have to search the field within which respondents' invention stands in connection with the examination of applications for patents on computer hardware.[4]

The nature of the arguments of petitioner that have just been discussed is, indeed, itself a reason for denying the writ. These arguments invite the Court to explore questions of policy that require the consideration of a wide range of broad economic and technologi-

[4] The Patent Office is no stranger to the use of sophisticated retrieval systems. It is in the advanced planning stages of a computer-aided classification and retrieval system designed to cope with the tremendous volume of prior art being generated in all technologies.

cal problems. This is not an appropriate case for the resolution of such questions. The invention here involved is limited both in its nature and in its economic significance. Moreover, the decision of the court below was an appeal from a proceeding in the Patent Office in which the record essentially consists solely of legal assertions and counter-assertions by respondents' attorneys and Patent Office examiners.[5] If the question that the petition seeks to present is in fact of the broad and general importance suggested, and if the circumstances adverted to in the petition in fact bear on its proper resolution, it is particularly desirable that it be considered by this Court only on a record where these and other circumstances can be fully developed in an adversary context, as in an infringement action. Compare *White Motor Co.* v. *United States*, 372 U.S. 253.

CONCLUSION

For the foregoing reasons, the petition should be denied.

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December 7, 1971

[5] The only factual evidence adduced in the proceeding, *viz.* certain prior art, was not involved in the appeal to the court below.

In the Supreme Court of the United States

OCTOBER TERM, 1971

No. 71-485

ROBERT GOTTSCHALK, ACTING COMMISSIONER OF PATENTS, PETITIONER

v.

GARY R. BENSON AND ARTHUR C. TABBOT

ON PETITION FOR A WRIT OF CERTIORARI TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS

REPLY MEMORANDUM FOR THE PETITIONER

The patent claims in issue here are not limited to any particular use, apparatus or machinery. Rather, as respondents admit, they broadly define exclusive rights to a process which "can be performed on most general purpose stored program computers * * * for converting signals encoded in the binary coded decimal (BCD) notation into signals encoded in the ordinary binary notation" (Resp. Br. p. 1). Although respondents assert that they intend to use the proce-

dures claimed for the purpose of switching telephone dial signals, this intended use is not an element of the claims. Indeed, the court below expressly observed that the claims "are directed solely to the art of data-processing itself" rather than to any particular technology (Pet. 25). Thus it described the two claims as a series of steps in a mathematical process, recorded for use in a computer by manipulating signals corresponding to "1" and "0", the two elements of binary notation (Pet. 28, 30).

Respondents also assert that they could have claimed "wired circuitry" as a means of embodying the logical operations required to apply the mathematical procedures they claim. But the short answer is that respondents did not claim any such apparatus. Instead they claimed a process which would be infringed by any application in a general purpose computer of the mathematical procedures described. Moreover, respondents' argument fails to distinguish between an application which claims a tangible apparatus, and one which claims the mathematical process it implements. Under the congressional scheme and the decisions of this Court, mathematical concepts and procedures are part of the common intellectual patrimony that every man has the right to apply in old ways and new on existing and future apparatus. *O'Reilly* v. *Morse*, 15 How. 62, 113. Such apparatus may itself be patentable if it does not duplicate previously known inventions. But even if a wired circuit or machine designed to carry out the steps claimed here is patentable, we submit that the procedures themselves are not.

If the issue of patentability of computer programs presented here is not resolved now, the Patent Office must in the future issue patents on such applications regardless of the effect on the developing computer industry, the public, and the patent system. This important question must, therefore, be resolved by this Court either now or else at the end of what could be an extended series of patent infringement suits. In this case the Patent Office sought to comply responsibly with this Court's mandate in *Graham* v. *John Deere Co.*, 383 U.S. 1, 18, that it should apply the high standards reflected in the patent decisions of the federal courts. The legal issue presented by the contrary decision of the court below is not one that will be illuminated by awaiting infringement litigation. As long as the question of the patentability of computer programs remains unresolved, however, a cloud will remain over the development of a new and vital sector of intellectual activity and of the economy. And, as the *Deere* decision pointed out, the courts will be unnecessarily burdened and the patent system debilitated by the uncertainty attending infringement litigation. *Ibid.* The issue should be resolved now. Compare *Brenner* v. *Manson*, 383 U.S. 519.

Respectfully submitted.

ERWIN N. GRISWOLD,
Solicitor General.

DECEMBER 1971.

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In the

Supreme Court of the United States

October Term 1971

No. 71-485

Robert Gottschalk,
Acting Commissioner of Patents,

Petitioner,

—*v.*—

Gary R. Benson and Arthur C. Tabbot,

Respondents.

ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS

BRIEF *AMICUS CURIAE* FOR BURROUGHS CORPORATION

Preliminary Statement

Burroughs Corporation (hereinafter Burroughs) is filing this brief *Amicus Curiae* on the merits in support of the Petitioner, the Acting Commissioner of Patents, pursuant to Rule 42 of the Supreme Court. The requisite written consents of the parties are on file with the Clerk of the Court. The matter is before the Court on a writ of certiorari to the United States Court of Customs and Patent Appeals which had reversed the decision of the Patent Office Board of Appeals affirming the Patent Examiner's rejection of claims 8 and 13 as unpatentable.

Questions Presented

1. Whether a mathematical expression or algorithm is patentable.

2. Whether an otherwise unpatentable mathematical expression or algorithm can be rendered patentable by describing it as a data processing method to be carried out by a general-purpose digital computer.

Interest of *Amicus Curiae*

Burroughs was incorporated in 1905, and is engaged in the business of designing, manufacturing and marketing a comprehensive range of products for the recording, storing, computing, processing and communicating of data. Burroughs business includes the development and maintenance of computer software for use with Burroughs computer products. Approximately 1800 professional employees are engaged full time in the company's research and development activities which resulted in an expenditure of $47,000,000 for the year 1971. A significant portion of these employees and of Burroughs research and development expenditure are attributable to the generation and support of computer software.

For the year which ended December 31, 1971, the dollar value of world-wide computer shipments has been reported to be $7,440,000,000. The actual sales value of Burroughs EDP shipments for the year 1971 amounted to approximately $531,000,000.

The disposition of the patent application before this Court will be of little significance to Burroughs since Bur-

roughs without further obligation and as part of a broader grant obtained a license nearly ten years ago to use the development covered by respondents' patent application. However, Burroughs believes that the general questions presented herein are much broader than potential liability under a single patent and, in fact, are of such great importance that an affirmance of the court's opinion below could well provide a crippling effect on the growth of the computer industry.

In view of Burroughs substantial involvement in the computer industry, it is Burroughs desire to bring before this Court several aspects of the questions presented in this case that may not be presented in the Petitioner's brief:

first, the historical development of mathematical expressions or algorithms as part of the "liberal arts" rather than the "useful arts";

second, the important distinction between mathematical principles and computer hardware;

third, the excessively broad scope of the patent applied for in this case, *i.e.*, a patent for the algorithm itself, even though the language of the claim gives the impression that the patent covers only specific computer hardware or operations;

fourth, the unreasonably broad and restrictive burden on the use of data processing equipment that would result from the patentability of algorithms or mathematical expressions; and

fifth, the availability of alternate means for protecting authors of computer programs based on algorithms or mathematical expressions.

Summary of Argument

The court below has either failed to understand the true nature of respondents' contribution or announced that mathematics is now for the first time embraced within the "useful arts" and can be patented. The clear implication of prior decisions of this Court is that mathematics, principles of nature and other abstract concepts are not patentable. *Funk Bros. Seed Co.* v. *Kalo Inoculant Co.*, 333 U.S. 127 (1948); *Le Roy* v. *Tatham*, 55 U.S. (14 How.) 156 (1852). Accordingly, it is more likely that the court below failed to appreciate the true nature of respondents' contribution which is an algorithm or mathematical expression. Upon reading respondents' patent application and arguments appearing in the Record below there can be no doubt that respondents have made a trivial modification to a well-known algorithm using an equally well-known principle of mathematics. Further, the most likely place to find prior art to be used against respondents' contribution is in mathematical textbooks and literature.

The confusion in this case stems from the way in which respondents have drafted their patent claims (*see* Appendix B, *infra*, pp. 12a-13a). Respondents have attempted to disguise the true nature of their contribution by garbing the patent claims with recitations that appear to be directed to hardware components of digital computers and digital computer operations. Even though algorithms and mathematical expressions are capable of being programmed for use on a general-purpose digital computer, they are not patentable since the computer does not change their

identity in any way; they are still merely algorithms. Nevertheless, by this association with the digital computer, respondents have, according to the court below, successfully managed to bring their algorithm or mathematical expression within the purview of the patent statutes. However, respondents have drafted their claims in a way which does not limit their patent coverage to the performance of their algorithm on any particular digital computer. The court below failed to grasp the extraordinarily broad scope of these claims, *i.e.*, a monopoly on the algorithm, *per se*. This would prevent any individual from using the algorithm or mathematical expression to write a series of program instructions to be executed by *any* general-purpose digital computer.

The practice of obtaining patents on algorithms or mathematical expressions will not *promote* progress in the digital computer field. The computer is just another tool for solving mathematical equations and algorithms, and these patents would restrict the freedom of the computer user. For the first time computer users, such as banks, government, universities and industry would run the risk that the algorithms or mathematical expressions they develop during the course of their normal use of the computer might "infringe" patents of others covering algorithms or mathematical expressions. Because of the abstract nature of this type of development, determining validity of patents and searching the prior art would be an enormous burden on the computer user. Such patents would not be consistent with the mandate in the Constitution to *promote* the progress of science and the useful arts.

Individuals who prepare computer programs based on algorithms or mathematical expressions can copyright their programs. While copyrights will not protect the algorithm, it will protect the investment made in writing the set of instructions comprising the program. If more protection is needed, Congress is the appropriate body to identify these needs and enact legislation specifically tailored to accommodate this new technology.

ARGUMENT

I.

MATHEMATICAL EXPRESSIONS AND ALGORITHMS ARE NOT EMBRACED IN THE "USEFUL ARTS" AND SHOULD NOT BE PATENTABLE.

A. The Essence of Respondents' Contribution Is a Modification of a Well-Known Algorithm or Mathematical Expression.

The respondents have characterized their invention as an algorithm during the prosecution of their patent application before the Patent Office.[1] The word "algorithm" was derived from the word "algorism", which meant the art of computing with arabic numbers.[2] Respondents have also provided a definition of an algorithm: " . . . a self-consistent set of ordered steps specifying definable operations and leading to a desired result."[3] Algorithms have been

[1] "To avoid further difficulties, it is here expressly admitted that applicants' method claims are directed to a machine algorithm for converting binary-coded-decimal representations into binary representations." R. 34 [References to the record in this case are indicated by "R."]

[2] VAN NOSTRAND'S SCIENTIFIC ENCYCLOPEDIA 59 (4th ed. 1968).

[3] R. 34.

created by mathematicians for centuries,[4] and some examples of the "classical algorithms" are addition, subtraction, multiplication and division.[5] The best known algorithm is Euclid's algorithm for finding the highest common factor of two given numbers.[6] Other commonly used algorithms include the extraction of square root,[7] radix conversion[8] and algorithms for converting decimal numbers, the most commonly used number system, to binary numbers, the number system used in digital computers.[9] The respondents have characterized their contribution as an " . . . algorithm or method for BCD-to-binary conversion." R. 55. At another point in their brief in the court below, respondents said, "It can be seen that appellants' most basic contribution to the art of digital data processing is in the *method* of translating BCD character representations to ordinary binary number representations. This overall method appellants have termed an 'algorithm' in accordance with common usage in the programming art." R. 59. The abbreviation BCD stands for Binary Coded Decimal which means that each decimal number is individually coded in binary form. Re-

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[4] A systematic method to transform fractions was given in the 1667 Edition of William Oughtred's *Clavis Mathematics*, Chapter 6, Section 18. *See* 2 D. KNUTH, THE ART OF COMPUTER PROGRAMMING 288 (1969).

[5] *Id.* at 229.

[6] VAN NOSTRAND'S SCIENTIFIC ENCYCLOPEDIA 59 (4th ed. 1968).

[7] A. BOOTH & K. BOOTH, AUTOMATIC DIGITAL CALCULATORS 184 (2d ed. 1956).

[8] Radix conversion techniques (for conversion of values from one numerical system to those of another) originated in ancient problems dealing with weights, measures and currencies. 2 D. KNUTH, THE ART OF COMPUTER PROGRAMMING 288 (1969).

[9] A. BOOTH & K. BOOTH, AUTOMATIC DIGITAL CALCULATORS 190-92 (2d ed. 1956).

spondents' algorithm then converts each such decimal number into a single continuous binary number composed of a string of "ones" and "zeros".[10] There can be no doubt that respondents' contribution is in the nature of an algorithm or mathematical expression.

Respondents have said that, "In order to overcome the disadvantages of the prior art conversion procedures, appellants have invented a completely different algorithm or method for BCD-to-binary conversion." R. 55. This is not the case. Upon even the most casual review by those skilled in the art of mathematics it is clear that respondents have at best modified a well-known algorithm[11] using a principle of mathematics known as "factoring".[12] By factoring the well-known algorithm fewer steps are required in order to carry out the arithmetic.[13] Furthermore, factoring eliminates the need to save and store partial results which would have to be added together at the end of the conversion. The court below identified this particular feature as an advantage of respondents' contribution,[14] although the court apparently did not appreciate the nature of respondents' contribution. A clear understanding by those with only a slight acquaintance with the mathematical principle of fac-

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[10] An example of respondents' algorithm is included in Appendix A, *infra*, pp. 3a-4a.

[11] *See, e.g.*, HIGH-SPEED COMPUTER DEVICES 411 (W.W. Stifler, Jr., ed. 1950).

[12] A. BOOTH & K. BOOTH, AUTOMATIC DIGITAL CALCULATORS 191 (2d ed. 1956).

[13] Appendix A, *infra*, pp. 3a-4a, describes the technique of factoring as it applies to converting a typical example of a decimal number into a binary number.

[14] Application of Benson & Tabbot, 441 F.2d 682, 683 (C.C.P.A. 1971).

toring will result in the conclusion that respondents' contribution is a trivial one. However, the primary purpose of the arguments made in this section and the examples given in Appendix A[15] is to identify the *nature* of respondents' contribution which is merely a modification of an algorithm or mathematical expression.

B. Mathematical Expressions and Algorithms Are Part of the "Liberal Arts" and Not Part of the "Useful Arts".

Congress has enacted laws pursuant to the United States Constitution[16] which provide for the issuance of patents to promote the progress of science and "useful arts".[17] The court below has found that respondents' alleged invention is part of the "useful arts" rather than the "liberal arts".[18] Since the essence of respondents' contribution is in fact an algorithm or mathematical expression the lower court's decision, if left standing, would in effect permit mathematics to be patented for the first time.[19] It is our belief that the court did not truly understand the nature of respon-

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[15] *See* Appendix A, *infra*, pp. 1a-11a.

[16] "The Congress shall have the power . . . to promote the progress of science and *useful* arts . . ." U.S. CONST. art. I, § 8, Clause 8 (emphasis added).

[17] "When used in this title [35, Patents] unless the context otherwise indicates—(b) The term "process" means process, art or method, and includes a new use of a known process, machine manufacture, composition of matter or material." 35 U.S.C. § 100(b) (1970);
"Whoever invents or discovers any new and useful process, . . . or any new and useful improvement thereof, may obtain a patent therefor . . ." 35 U.S.C. § 101 (1970).

[18] Application of Benson & Tabbot, 441 F.2d 682, 688 (C.C.P.A. 1971).

[19] The negative effects of such a decision are reviewed in Section IV, *infra*, pp. 17-22.

dents' contribution.[20] However, respondents had a much clearer understanding of the nature of their invention during prosecution of their patent application when they made the following challenge to the U.S. Patent Office Examiner: "Applicants challenge the Examiner to cite any decision of any court or other tribunal in which it is stated that mathematical calculations, per se, as distinguished from the mental process of performing such calculations are unpatentable." R. 36. This challenge should not escape final determination by this Court. Mathematics has been a part of the "liberal arts" for centuries.[21] As part of this Court's decision in this case, it appears to be necessary to state that mathematical expressions and algorithms and any other form of mathematics, *per se*, are not patentable.

II.

MATHEMATICAL EXPRESSIONS OR ALGORITHMS ARE NOT PATENTABLE EVEN THOUGH THEY MAY BE PROGRAMMED ON A GENERAL-PURPOSE DIGITAL COMPUTER.

An attempt has been made to classify respondents' algorithm as a special kind of algorithm because it has been associated with a general-purpose digital computer. Respondents have attempted to label their algorithm as a

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[20] This possibility is explored in Section III, *infra*, pp. 13-17.

[21] "Liberal Arts . . . 1: the studies comprising the trivium [grammar, rhetoric and logic] and quadrivium [arithmetic, geometry, music and astronomy] in the middle ages 2: the studies (as language, philosophy, history, literature, abstract science) esp. in a college or university that are presumed to provide chiefly general knowledge and to develop the general intellectual capacities (as reason or judgment) as opposed to professional, vocational, or technical studies . . ." WEBSTER'S NEW INTERNATIONAL DICTIONARY—UNABRIDGED 1303 (3d ed. 1963).

"machine" algorithm.[22] This is misleading and confusing. The fact that respondents' algorithm, or any other algorithm or mathematical expression, can be used as a basis for writing a program in no way changes the nature of the algorithm or mathematical expression. The typical procedures followed in writing programs are outlined below.

A mathematician, logician or other theoretician selects a known algorithm or derives a new algorithm which represents the minimum time or optimum way of solving a given problem. The technique that each of these individuals use to arrive at the algorithm depends upon his background and educational training. Some theoretical mathematicians prefer to use classical algebraic expressions while logicians may use another branch of mathematics known as "Boolean algebra" or "Truth Tables".[23]

After the algorithm is established, a "flow-chart" or other diagram may be prepared that represents the way in which the numbers, data or other information will flow during the progressive solution to the problem. To implement the flow-chart, trained programmers prepare a list of instructions in a programming language selected from among a number of different possible languages. Typical programming languages are ALGOL (ALGOrithmic Language), FORTRAN (FORmula TRANslation), COBOL (COmmon Business Oriented Language), PL I (Programming Language I), as well as the various programming languages used by respondents in their own list of instructions. R.

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[22] "To avoid further difficulties, it is here expressly admitted that applicants' method claims are directed to a machine algorithm for converting binary-coded-decimal representations into binary representations." R. 34.

[23] *See* Appendix A, *infra*, pp. 5a-11a, which illustrates these techniques.

57, 81. Each of these programming language instructions is then recorded on a punched card, magnetic tape or some other form of record by keyboard operators. This record is then compiled (translated) into a series of new program instructions in another language commonly called a machine language or object code. These translated instructions are capable of directly controlling the operation of a general-purpose digital computer. The actual translation is normally accomplished on a computer which itself has been programmed in a special way depending upon the particular programming language, *e.g.*, ALGOL or FORTRAN, selected by the programmer. Translations can be made to accommodate many different general-purpose digital computers. These computers may vary in size and contain different hardware components for performing a given computer operation. The operator places the translated program into the storage facility of the computer and at the same time may similarly place the data which is to be processed by the computer. This completes the series of steps starting with the algorithm and ending with a programmed general-purpose digital computer.

The algorithm that was originally established by the mathematician, logician or other theoretician remains *unchanged and unaffected* by the programmers, operators and others who are involved in preparing the program. Accordingly, algorithms used as the basis for writing programs are nevertheless merely algorithms. The obscure language form of the steps taken by the programmers and the complexity of the digital computer itself should not mislead one into the conclusion that algorithms become special or somehow different (*i.e.*, a "machine" algorithm) through their association with the general-purpose digital computer.

III.

RESPONDENTS HAVE ATTEMPTED TO SHIFT THE ESSENCE OF THEIR CONTRIBUTION FROM AN ALGORITHM OR MATHEMATICAL EXPRESSION TO A DATA PROCESSING METHOD BY GARBING THEIR CLAIMS 8 AND 13 WITH DIGITAL COMPUTER OPERATIONS OR WELL-KNOWN HARDWARE.

There are two claims remaining in respondents' patent application for consideration by this Court.[24] Each claim has recitations which emphasize hardware components of computers[25] or operations performed by digital computers.[26] These recitations are completely inconsistent with the fact that respondents' only contribution is an algorithm or mathematical expression. As pointed out in Section I,[27] respondents have repeatedly described their contribution as an algorithm. Further, these recitations are inconsistent with the patent disclosure made by respondents; a *program* is the "best mode" of respondents' invention.[28] The respondents did not set out to patent the general-purpose computer, *per se*, but indicated that their invention relates

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[24] Claims 8 and 13 are reproduced in Appendix B, *infra*, pp. 12a-13a.

[25] "Reentrant shift register" in claim 8. Appendix B, *infra*, p. 12a.

[26] "Storing, shifting, masking, adding, testing, detecting, exhausting and repeating" in claims 8 and 13. Appendix B, *infra*, pp. 12a-13a.

[27] *Supra*, pp. 6-10.

[28] "The patent disclosure was made in terms of programming a general-purpose computer, however, because this is 'the best mode contemplated by the inventor of carrying out his invention'. (35 U.S.C. 112)" R. 57. Disclosure of the "best mode" is required by statute, 35 U.S.C. § 112 (1970).

to programming." Accordingly, it is misleading to include these recitations in claims 8 and 13.

These recitations are also improper because they do not serve to restrict the scope of respondents' claims in any way, and permit the respondents to obtain a monopoly as broad as the algorithm. Taking claim 8 for instance, the words "reentrant shift register" sound like a hardware component of a digital computer. However, upon examining the function performed by this component it is readily apparent that there are numerous equally suitable components that can perform the same function." Further, each of these can perform the same function in respondents' algorithm equally well. Accordingly, the algorithm is not enhanced, changed or any more readily suited for operation on a "reentrant shift register" than on any of the other equally suitable hardware components. It would seem that this recitation was placed in claim 8 for the purpose of causing respondents' algorithm to appear to be critically dependent upon a unique component of a general-purpose digital computer. This would presumably allow respondents' algorithm to be called a "machine" algorithm, thereby fitting it within the line of decisions announced by the court below regarding computer programs."

" "This invention relates to the processing of data by program and more particularly to the programmed conversion of numerical information."

"A program is a set of instructions for processing data in a preassigned fashion. The program consists of a series of steps, each of which include one or more instructions whose location in storage is given by an accompanying address." R. 3.

" *E.g.*, rotating drums, delay lines, random access memories, tape loops.

" Application of Prater, 415 F.2d 1378 (C.C.P.A. 1968); Application of Prater, 415 F.2d 1393 (C.C.P.A. 1969); Application of

The problem now becomes one for the prospective infringer and the district courts, since the court below does not have jurisdiction over matters of infringement."

Doctrine of Equivalents

Prospective infringers are well aware of the doctrine of equivalents[11] applied by the courts which try questions of infringement.[12]

The recitation in claim 8 of a "reentrant shift register" is likely to be a very thin shield for the prospective infringer to hide behind. No doubt in any case where the essence of the invention is in the algorithm, the party who programs a general-purpose computer to perform the algorithm will be found to be guilty of infringement. This would be so regardless of the particular names of hardware components recited in the patent claims. Respondents have already stated that this is the case, "This algorithm or method can be equally well implemented by con-

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Bernhart, 417 F.2d 1395 (C.C.P.A. 1969); Application of Mahony, 421 F.2d 742 (C.C.P.A. 1970); Application of Musgrave, 431 F.2d 882 (C.C.P.A. 1970); Application of Foster, 438 F.2d 1011 (C.C.P.A. 1971).

[11] 28 U.S.C. §§ 1291, 1338, 1498, 1542 (1970).

[12] "'. . . a patentee may invoke this doctrine to proceed against the producer of a device 'if it performs substantially the same function in substantially the same way to obtain the same result.' . . . The theory on which it is founded is that 'if two devices do the same work in substantially the same way, and accomplish substantially the same result, they are the same, even though they differ in *name, form or shape.*'" *Graver Tank & Mfg. Co. v. Linde Air Prods. Co.*, 339 U.S. 605, 608 (1950) (emphasis added).

"This situation emphasizes the anomaly where the Court of Customs and Patent Appeals is able to require certain claim language although it will never have to interpret that language in the context of infringement or the range of equivalents.

ventional circuitry . . . or by programming another general-purpose computer. . . . Moreover, each of these implementations is obvious from the others (appellants' attorney prepared the implementations . . . without technical assistance). For these reasons, method claims were included in the present application." R. 50.

The facade of computer hardware is even more transparent in claim 13 which has no hardware component recitations, but instead has very broad language directed to general-purpose digital computer operations." This language is not limiting at all since it reads equally well on any form of general-purpose digital computer. Accordingly, this claim, as it stands, without the necessity of employing the doctrine of equivalents, obtains for the respondents a monopoly as broad as the algorithm, *per se*.

Garbing the Principle of Mathematics

Recitations relating to computers were found by the court below to be significant at least with regard to claim 8." This is clear error. This Court has held that the discovery of a natural principle is not patentable and that if this discovery is the only contribution that the inventor has made, he is not entitled to a patent since this would in effect allow a patent to issue on the natural principle itself." The case here is analogous. Respondents' con-

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" *See* n.26, *supra*, p. 13.

" "Claim 8 is for a method to be practiced in part on particular apparatus specified to be a 'reentrant shift register'." Application of Benson & Tabbot, 441 F.2d 682, 687 (C.C.P.A. 1971) (emphasis in original).

" Funk Bros. Seed Co. v. Kalo Inoculant Co., 333 U.S. 127, 130 (1948); *Le Roy* v. Tatham, 55 U.S. (14 How.) 156, 175 (1853).

tribution is a mathematical expression or algorithm. Garbing claims 8 and 13 with meaningless recitations cannot disguise the true nature of respondents' contribution. If the lower court decision is left standing, it will invite others to garb their claims with language directed to the obvious hardware components of machines in order to secure patent protection upon mathematical equations, algorithms and other principles of mathematics.[18] This practice would no doubt spread beyond the digital computer field and could be applied to all other industries as well, since mathematics has a virtually unlimited application. A simple algorithm could then lead one to dominate the field of application merely by reciting the type of machine and a few of its obvious components, whether it be for such diverse arts as weaving machines or pumps.

IV.

PROGRESS IN THE DIGITAL COMPUTER FIELD WILL NOT BE PROMOTED BY GRANTING PATENTS ON MATHEMATICAL EXPRESSIONS OR ALGORITHMS.

A. The Computer Is Merely a Tool With a Greater Capacity for Performing Mathematical Calculations.

The general-purpose digital computer is just another tool for mathematicians, logicians, theoreticians and others who require the solutions to complex problems. Prior to the advent of the digital computer, problems were solved on mechanical calculators and, prior to that, with pencil and paper. Patents granted on algorithms, such as the one

[18] The adverse effect upon the digital computer field is discussed in Section IV, *infra*, pp. 17-22.

before this Court, would grant the owner an extremely broad monopoly inconsistent with the contribution made to the general reservoir of human knowledge. Such patents would restrict the users of all general-purpose digital computers which are programmed to solve a given algorithm. There is no difference between this type of restriction and attempting to restrict the *manner of using* mechanical calculators or even pencil and paper as distinguished from the apparatus themselves. Patents of this type would impede progress because the computer is merely a tool having greater capacity to assist in solving problems that are otherwise solvable only by tedious human effort. The power of the digital computer is increasing, and the complexity of the algorithms and mathematical expressions which it can solve is also increasing. As the importance of this tool to the technological and scientific community increases, its growth should not be encumbered by patents covering the algorithms and mathematical expressions it is designed to solve.

B. Evaluation of Potential Liability for Infringement of Patented Algorithms and Mathematical Expressions Would Be Impractical.

Algorithms and mathematical expressions could reside in many different forms. For example, they may take the form of printed program listings as illustrated by respondents (R. 57, 81), punched cards, magnetic tape, magnetic disks and many other forms of records. The records themselves can be readily transported from one general-purpose computer to another. The algorithm can also be transported without moving the records by simply reading one record and transmitting signals via telephone lines, micro-wave conduits, radio transmission or satellite communication sys-

tems to a record at any other point in the world. The number of computer installations and the number of programmers are expanding rapidly. Accordingly, the potential number of sites for infringement to take place is correspondingly increasing. This, coupled with the high degree of mobility of the program makes detection of patent infringement impractical.

Infringement could also be deliberately avoided by exporting the program to a computer facility outside of the United States and performing the algorithm beyond the bounds of protection afforded by the U.S. patent laws.[*] The processed data could then be returned to the United States. Such an operation would be appealing since most countries have denied patent protection to algorithms such as that proposed by respondents. This would not only frustrate the patent owner but also provide an inducement for carrying on data processing operations outside the U.S. thereby denying the U.S. economy the benefit of the revenue produced by such operations.

Assuming that a computer program has been found and is alleged to infringe a patent, it will be necessary to determine its validity. This would be an extremely difficult task because there is no accepted way of representing algorithms so they can be classified and filed in a library of prior art. There is essentially no body of classified prior art in existence at this time which could be reasonably assembled and used by the U.S. Patent Office to examine patent applications of this type. Where, as in this case, the essence of the contribution is in a mathematical expression or algorithm, the most likely place to find prior art is in public and private

[*] The patent grant is to exclude others . . . in the United States. 35 U.S.C. § 154 (1970).

libraries containing textbooks, treatises and other literature dealing with various branches of mathematics. Some typical examples of the type of prior art that would have to be searched are found in Appendix A, which also illustrates that the same algorithm can be expressed in many different ways.[40] Accordingly, it would be expected that numerous invalid patents would be issued by the U.S. Patent Office and the burden of finding prior art would be shifted to members of the computer industry.

Specific Burdens to Be Placed Upon the Computer User

Computer users may be found in all branches of industry, science, health, finance, medicine, manufacturing, government and many more. Any one of these users can develop or adopt algorithms to be used as the basis for writing programs in accordance with the procedures briefly described in Section II.[41] Many of these users do not market products that are embraced by the patent laws. If algorithms are found to be patentable, for the first time these users would become possible "infringers". The computer user normally has little knowledge of the particular hardware components included in his general-purpose computer, or the nature of the operations taking place within the computer. He is concerned solely with the work the computer will perform for him with high speed and efficiency. The

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[40] In Appendix A, Third Example, *infra*, pp. 5a-8a, a classical mathematical expression is shown. In Appendix A, Fourth Example, *infra*, pp. 8a-11a, algorithms are expressed in accordance with mathematical languages used by logicians, commonly known as "Boolean algebra" and "Truth Tables".

[41] *See* pp. 11-12, *supra*.

user may not even own a computer or have one on his premises. In "time-sharing" systems, many users are connected via telephone lines to a central computing system and simply buy time on the computing system on a pay-as-you-go basis. The user may supply his own programs or borrow a program from a library. Accordingly, the user is not concerned with the particular type of machine on the other end of the telephone line but simply desires an end result, service to obtain a solution to his algorithm—the basis from which his program was written. It can readily be seen that if the user who is charged with infringement must examine claims, such as the present claim 8, which contain recitations defining hardware components of computers, he may lack the necessary design information regarding his computer. Accordingly, he will not be able to determine whether he is infringing. This lack of information may also prevent the user from obtaining a patent on an algorithm he has created. If it is necessary to recite computer hardware components in his claims, the user will be unable to translate the definition of his algorithm from a mathematical expression to an English language version using hardware components of a computer."

Computer users would quickly turn to the computer manufacturers and demand indemnification against patent infringement caused by programming the general-purpose digital computer in the same manner that they now demand and obtain indemnification on computer hardware. This would be like the purchaser of a piano or an adding machine asking the manufacturer for an indemnification against copyright or patent infringement caused by the

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" *See* Section III, *supra*, pp. 13-17, which explains the reason why the lower court decision would foster this practice and argues that this is not a satisfactory practice.

purchaser pushing any given sequence of keys to play music or perform a calculation. There is no doubt that some computer manufacturers would endeavor to indemnify as many customers as their financial resources would permit, even though it is as inappropriate for computers as it is for pianos and adding machines. For example, the price of the computers could be increased and a fund set aside to take care of patent problems as a form of insurance policy for computer users. This would not have a healthy impact on competition among the computer manufacturers, since the users may be inclined to gravitate to the computer manufacturer that offered the maximum patent indemnity secured by the greatest funds. The progress of the computer field would not be promoted by this, and in the long run, the computer user would suffer.

V.

PROGRAMS ARE ALREADY ENTITLED TO COPYRIGHT PROTECTION.

Denying patent protection on algorithms or mathematical expressions would not mean that individuals who develop computer programs would be without some form of federal statutory protection. In recent years there has been a growing tendency to protect programs by copyright.[43] The author generally grants a license to the computer user permitting the user to copy and run the program.

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[43] *All* writings of an author may be copyrighted, and the author has many exclusive rights to copyrighted work. 17 U.S.C. §§ 1, 4 (1970) (emphasis added).

Copyright protection for programs is appropriate because writing a program is analogous to writing other literary works, for example, music which has been copyrighted for many years.[44] The copyright law is preferable over other forms of statutory protection for programs because it will not produce the negative effects on the digital computer field outlined in Section IV.[45] The copyright law requires that an infringer actually copy another's copyrighted work. Should a programmer develop a program on his own without access to the copyrighted program, he need not concern himself with infringement. Also, the copyright laws would not protect the broad mathematical principles or algorithms which may have been used in the preparation of the program. Therefore, these mathematical principles and algorithms would remain in the public domain for free use by everyone. However, the effort and time spent in creating the particular set of instructions comprising the program would be protected by copyright.

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[44] A program is a list of instructions to be carried out by a computer; for respondents' lists, *see* R. 57, 94. Music written on paper, commonly called sheet music, is a series of notes written on a staff. The program is written in a notation called programming language such as ALGOL, FORTRAN, or COBOL (*See* Section II, *supra*, pp. 11-12). Music has its own separate form of notational language. Each one is an expression of a series of instructions to be executed or performed by machines or instruments. Both the program and music can be recorded in many different forms. For example, the program can be recorded on magnetic tape or disks and perforated cards or tapes. Music can be recorded on magnetic tape, phonograph records and perforated rolls. Continuing with the analogy as it applies to a program recorded on perforated tape and music recorded on a perforated roll, it can be seen that there is an equivalence between the general-purpose computer and the player piano. The computer processes data in accordance with a program of instructions recorded on perforated tape, while the player piano creates tones in accordance with the instructions recorded on the perforated roll.

[45] *Supra*, pp. 17-22.

VI.

CONGRESS IS THE PROPER BODY TO CREATE LAWS REGARDING PROGRAMS.

If a new federal statutory protection for programs is required, Congress is the proper body to enact that law. In the past, advances in technology have caused cases to be reviewed by this Court in light of laws written long before the advance in technology. An example of this occurred in the case of the cable TV technology[46] and much earlier in the case of recording copyrighted works.[47] In each of these cases, this Court had to apply an old statute to a technology which was developed after the passage of the statute. In doing so, this Court refused to extend the statute to cover the new technology, but instead left such action for Congress. In the case of recording copyrighted works, Congress responded by enacting a specific statute tailored to deal with the unique characteristics of the new technology.[48]

Programming is far more complex and has a much wider impact upon our society than any of the aforementioned new technologies previously considered by this Court. If there is a need for new federal statutory protection, or modifications to existing laws, the Congress should again enact the appropriate legislation.

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[46] Fortnightly Corp. v. United Artists Tel. Inc., 392 U.S. 390 (1968).

[47] White-Smith Music Pub. Co. v. Apollo Co., 209 U.S. 1 (1908).

[48] 17 U.S.C. § 1(e) (1970), was amended on March 4, 1909, the year after the White-Smith v. Apollo decision.

CONCLUSION

For the foregoing reasons, *Amicus Curiae* urges the Court to find that the subject matter of respondents' patent application is not embraced within the patent laws and, accordingly, that the decision of the Court of Customs and Patent Appeals be reversed.

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APPENDIX A

Mathematical Considerations Concerning Converting Numbers from Binary Coded Decimal to Binary

The purpose of this Appendix A is to explain that respondents' contribution is merely a mathematical expression or algorithm and as such can be expressed in a number of vastly different mathematical forms and terminologies. Further by utilizing simple examples, respondents' contribution will be recognized by those familiar with mathematics to be a trivial modification of standard algorithms for converting numbers from Binary Coded Decimal to Binary notation.

Summary

The First Example illustrates a conventional, straightforward multiplication method for converting a decimal number into a corresponding binary number.

The Second Example illustrates the convenience which arises in solving the same problem set forth in the First Example when the well-known mathematical principle of factoring is employed before the initial multiplication steps are carried out.

The Third Example illustrates a detailed mathematical analysis of the generalized algorithm for converting numbers from Binary Coded Decimal to Binary form. This analysis and methodology clearly brings out the inherent shifting property of numbers which is useful in effecting multiplication in computing apparatus and in converting numbers from Binary Coded Decimal to Binary notation.

The Fourth Example illustrates the fact that the algorithm embraced by respondents' patent application claims 8 and 13 may be expressed either in the Truth Table form of propositional calculus[1] or by Boolean algebra.[2] These latter forms of expression are everyday tools of a mathematical logician or logic designer of computer hardware.

FIRST EXAMPLE: Brute Force Multiplication

The decimal number 953, can be represented as follows, recognizing that the 9 is in the one-hundreds position and the 5 is in

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[1] P. Rosenbloom, The Elements of Mathematical Logic 28 (1950).

[2] See G. Boole, The Laws of Thought (1854).

the tens position thus giving them weights of one hundred and ten, respectively:

Expression 1 $(9 \times 100) + (5 \times 10) + 3 = 953$

The left-hand portion of Expression 1 can be represented in the binary number system as follows:

Expression 2 $(1001 \times 1100100) + (0101 \times 1010) + (0011) = 953$

A straightforward technique of multiplication of binary and decimal numbers respectively can be carried out in the commonly known manner as follows:

Expression 3	Binary	Decimal Equivalent
	1100100	100
	X 1001	X 9
	1100100	
	1100100	
3(a)	1110000100	900
	1010	10
	X 0101	X 5
	1010	
	1010	
3(b)	110010	50

This results in two partially converted portions of information, 3(a) and 3(b). When performed on a computer both 3(a) and 3(b) must be stored in the computer memory and then retrieved after all operations have been completed so that the partial results can then be added together to give the final result as follows:

Expression 4	Binary	Decimal Equivalent
	1110000100	900
	110010	50
	+ 0011	+ 3
	1110111001	953

SECOND EXAMPLE: Classical Factoring

Instead of performing the calculations in accordance with the steps of the First Example, if Expression 1 is first factored by removing a ten from the tens and hundreds position, then this same problem may be expressed and solved as follows:

Expression 5 $(9 \times 10 + 5) \times 10 + 3 = 953$

As before, the decimal numbers of the left-hand side of Expression 5 may be converted into their binary equivalents as follows:

Expression 6 $(1001 \times 1010 + 0101) \times 1010 + 0011 = 953$

According to the common mathematical practice, one begins solving the problem in Expression 6 by first working upon the numbers appearing within the parentheses as follows:

Expression 7

Binary	Decimal Equivalent
1010	10
× 1001	× 9
1010	90
1010	
+ 0101	+ 5
1011111	95

Next, the above results within the parentheses are operated upon by multiplying the sum (95) by the factor (10) and adding the remaining units digit (3) as follows:

Expression 8

Binary	Decimal Equivalent
1010	10
× 1011111	× 95
1010	50
1010	90
1010	
1010	
1010	
1010	
+ 0011	+ 3
1110111001	953

As can be seen, by factoring out ten from the numbers within the parentheses of Expressions 5 and 6, each operation directly utilizes the results from the previous operation. The work may now be carried out without the necessity of writing down the partial results 3(a) and 3(b), or if performed by a computer instead of by hand, without storing these partial results in the computer storage facility. Thus respondents' mathematical contribution is merely a routine application of the well-known mathematical technique of factoring[3] so as to create a slightly different algorithm. The court below was wrongly impressed with the "discovery" that by adding a binary "1" in two specific places, conversion can be accomplished.[4] The fact that the binary "1" is added to the two specific places is a direct result of factoring the binary number 1010 (*i.e.*, decimal 10) out of Expression 5. When, once again, the binary number 1010 is multiplied back into the factored expression a binary 1 is added to two specific places. This is graphically illustrated by Expression 8 where the binary number 1010 is added six times and progressively shifted over to the left. This then results in the addition of a binary "1" to two specific bit positions of the binary number 3 in Expression 8.

This example illustrates the complete independence of respondents' mathematical contribution from the hardware components that may be included in any given general-purpose digital computer. It is misleading to recite language in patent claims directed to computer hardware components or operations when describing a simple algorithm or mathematical expression.

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[3] "It is more convenient to adopt the less direct method now to be described. This is best illustrated by an example; thus, suppose the number 0.431 is to be converted to the binary scale. This can be written:

$$10^{-3}((4.10 + 3)\ 10 + 1)$$

The process can be analyzed as follows:

Multiply the first digit of the number by 10 (1010 in binary scale), add in the next digit and multiply by 10, add in the next digit, *etc.* This process is repeated until all the digits have been used." A. Booth & K. Booth, Automatic Digital Calculators 190–91 (2d ed. 1956).

[4] "It will aid in understanding the terms of claim 13 to state that the discovery which is the essence of appellants' invention was that, for each bit position in each BCD digit, conversion can be accomplished by adding a binary '1' to two specific positions of the next lesser significant BCD digit and that in normal notation 'significance' of bits or digits increases to the left, e.g., in the decimal number '53' the 5 is more significant than the 3. Thus conversion can be carried out by the steps of (1) testing each BCD

THIRD EXAMPLE:
Analysis of Generalized Mathematical Algorithm for Binary Coded Decimal to Binary Conversion

Number Representations: Positionally coded numbers to any base, for example Decimal, Binary Coded Decimal and Binary, may be graphically represented as follows, with the more significant digit positions increasing from right to left:

Decimal

D_n	...	D_i	...	D_1	D_0

D_i *are Decimal Digits*

Binary Coded Decimal (BCD)

nd_3	nd_2	nd_1	nd_0	...	id_3	id_2	id_1	id_0	...	od_3	od_2	od_1	od_0

id_i *are Binary Digits*

Binary

b_m	...	b_i	...	b_2	b_1	b_0

b_i *are Binary Digits*

A number N may then be expressed as follows:

Decimal: $$N_{10} = \sum_{i=0}^{n} D_i \times 10^i$$

Binary Coded Decimal: $$N_{10} = \sum_{i=0}^{n} \sum_{j=0}^{3} id_i \times 2^j \times 10^i$$

Binary: $$N_2 = \sum_{i=0}^{m} b_i \times 2^i$$

The mathematical basis of and method for conversion between any different number bases, for example decimal to binary conversion, may be derived by analyzing the expanded generalized expressions.

---

bit position for all but the least significant BCD digit and (2) for each '1' bit detected, adding a binary '1' to each of two specified bit positions in the next lesser significant BCD digit." Application of Benson & Tabbot, 441 F.2d 682, 688 (C.C.P.A. 1971).

For corresponding decimal and binary numbers (N_{10} and N_2) the expanded expressions are:

$$N_{10} = D_0 \times 10^0 + D_1 \times 10^1 + \ldots + D_n \times 10^n = N_2$$

$$N_2 = b_0 \times 2^0 + b_1 \times 2^1 + \ldots + b_m \times 2^m$$

Hence $b_i = f_i(D_0, D_1, \ldots, D_n)$ for converting decimal to binary.

Expanding the decimal expression we have:

$$N_{10} = D_0 \times 10^0 + D_1 \times 10^1 + \ldots + D_n \times 10^n$$

Factoring a 10 at each level of the expansion yields:

$$N_{10} = D_0 + 10(D_1 + 10(D_2 + \ldots + 10(D_{i-1} + 10(D_i + 10(D_{i+1} + \\ + \ldots + 10(D_{n-1} + 10(D_n)) \ldots))$$

Analyzing the relationship between the i^{th} element and the $i-1^{st}$ element of this last expression we have:

$$10D_i + D_{i-1}$$

That is, 10 times the more significant digit (i^{th}) is added to the lesser significant digit ($i-1^{st}$). Thus:

$$10(id_3 \times 2^3 + id_2 \times 2^2 + id_1 \times 2^1 + id_0 \times 2^0) + \\ + ((i-1)d_3 \times 2^3 + (i-1)d_2 \times 2^2 + (i-1)d_1 \times 2^1 + (i-1)d_0 \times 2^0)$$

For a digital computing machine in which numbers are expressed in binary notation, the following statements are true and need no proof: (*Note:* Subscripts represent the number base.)

(1) The decimal number ten $(10)_{10}$ is represented as $(1010)_2$

and

(2) Multiplication of a number by 2^n is equivalent to shifting the number to the left by n binary digit positions.

Therefore, the expression

$$[10 \times (id_3 \times 2^3 + id_2 \times 2^2 + id_1 \times 2^1 + id_0 \times 2^0)] + D_{i-1}$$

becomes

$$[id_3 \times 2^3 \times 10 + id_2 \times 2^2 \times 10 + id_1 \times 2^1 \times 10 + id_0 \times 2^0 \times 10] + D_{i-1}$$

or

$id_3 \times (1010_2$ Shifted left 3 positions)
$+ id_2 \times (1010_2$ Shifted left 2 positions)
$+ id_1 \times (1010_2$ Shifted left 1 position)
$+ id_0 \times (1010_2$ Shifted left 0 positions)
$+ D_{i-1}$

To clearly illustrate the shifting property of numbers, let us assume the summation has reached and included the D_{i-1} term. The general procedure to be continued is then to test each id_j (j = 0, 1, 2, 3) and

Step 1
if id_0 is a 1, then add 1010 to the sum; and

Step 2
if id_1 is a 1, then add 10100 to the sum; (or 1010 to a sum that has been shifted right one position); and

Step 3
if id_2 is a 1, then add 101000 to the sum; (or 1010 to a sum that has been shifted right two positions); and

Step 4
if id_3 is a 1, then add 1010000 to the sum; (or 1010 to a sum that has been shifted right three positions).

In each case, if id_j is a 0, then no addition to the summation is necessary, i.e. add 0000 . . .

Thus, the example given by respondents of converting $(53)_{10}$ from its Binary Coded Decimal form to Binary may be seen to merely involve the shifting property of numbers and not a "discovery" that conversion from BCD to Binary may be accomplished by adding a binary "1" to two specific places.

$$(53)_{10} = (0101\ \ 0011)_{BCD}$$

"5" "3"

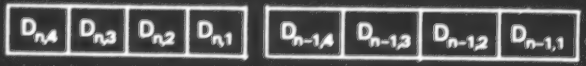
0101		0011	
	+	1010	*Step 1*
	+	00000	*Step 2*
	+	101000	*Step 3*
	+	0000000	*Step 4*
		0110101	

Hence $(0101\ \ 0011)_{BCD} = (0110101)_2$

FOURTH EXAMPLE:
A Typical Logic Designer's Expression of Respondents' Algorithm

The algorithm of Claims 8 and 13 can be represented in the Truth Table form of propositional calculus as follows:

1. Designate as $D_{n,i}$ the i^{th} bit of the n^{th} BCD grouping of bits in the BCD expression:



2. Form a Truth Table which shows the value of the modified (binary-converted) bits as a function of the possible combinations of $D_{n,1}$ and $D_{n,2}$ and $D_{n,3}$ and $D_{n,4}$. Now, by inspection of the Truth Table, yet another representation of respondents' algorithm can be given by the Boolean formulae for each of the modified bits D_i which may be written as follows:

$$D_{n-1,1}\ (modified) = D_{n-1,1}$$

$$D_{n-1,2}\ (modified) = D_{n-1,2} \cdot (\overline{D_{n,4}} \cdot \overline{D_{n,1}} + \overline{D_{n,3}} \cdot \overline{D_{n,2}} \cdot \overline{D_{n,1}}) + \overline{D_{n-1,2}} \cdot (\overline{D_{n,4}} \cdot D_{n,1} + \overline{D_{n,3}} \cdot \overline{D_{n,2}} \cdot D_{n,1})$$

The Boolean formulae for each of the modified bits $D_{n-1,2}$ *(modified)* when written out in this fashion are the form of the algorithm used by the logic designer of hardware to implement this algorithm in computer hardware.

The Truth Table illustrates respondents' algorithm in the classical form of mathematical logic. In the manner demonstrated above, the Boolean formulae for each of the modified bits can likewise be written out, by inspection, from the Truth Table. The full details of this example have been omitted for the sake of simplicity, since such details would be obvious to one skilled in the art of logic design.

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APPENDIX B

The following are the two claims remaining in respondents' application:

8. The method of converting signals from binary coded decimal form into binary which comprises the steps of

(1) storing the binary coded decimal signals in a reentrant shift register,

(2) shifting the signals to the right by at least three places, until there is a binary "1" in the second position of said register,

(3) masking out said binary "1" in said second position of said register,

(4) adding a binary "1" to the first position of said register,

(5) shifting the signals to the left by two positions,

(6) adding a "1" to said first position, and

(7) shifting the signals to the right by at least three positions in preparation for a succeeding binary "1" in the second position of said register.

13. A data processing method for converting binary coded decimal number representations into binary number representations comprising the steps of

(1) testing each binary digit position *i*, beginning with the least significant binary digit position, of the most significant decimal digital representation for a binary "0" or a binary "1";

(2) if a binary "0" is detected, repeating step (1) for the next least significant binary digit position of said most significant decimal digit representation;

(3) if a binary "1" is detected, adding a binary "1" at the (i + 1)th and (i + 3)th least significant binary digit positions of the next lesser significant decimal digit representation, and repeating step (1) for the next least significant binary digit position of said most significant decimal digit representation;

(4) upon exhausting the binary digit positions of said most significant decimal digit representation, repeating steps (1) through (3) for the next lesser significant decimal digit

representation as modified by the previous execution of steps (1) through (3); and

(5) repeating steps (1) through (4) until the second least significant decimal digit representation has been so processed.

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MICHAEL RODAK, JR., CLERK

IN THE

Supreme Court of the United States

OCTOBER TERM, 1971.

No. 71-485

ROBERT GOTTSCHALK, ACTING COMMISSIONER OF PATENTS,

Petitioner,

vs.

GARY R. BENSON AND ARTHUR C. TABBOT,

Respondents.

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IN THE

Supreme Court of the United States

OCTOBER TERM 1971.

No. 71-485.

ROBERT GOTTSCHALK, ACTING COMMISSIONER OF PATENTS,

Petitioner,

vs.

GARY R. BENSON AND ARTHUR C. TABBOT,

Respondents.

BRIEF AMICUS CURIAE FOR HONEYWELL INC.

Honeywell Inc. submits this brief amicus curiae with the written consent of all the parties to the case. The brief is filed in accordance with the provisions of Rule 42(2) of the Rules of the Supreme Court of the United States.

I.

QUESTION PRESENTED.

This case presents the question whether a method comprised of a series of mathematical operations for converting numerical information from one number form to another is a patentable discovery which promotes the progress of the useful arts within the purview of Art. I, § 8, cl. 8, of the Constitution of the United States.

II.

STATEMENT OF THE CASE.

The question presented arises because the court below has conferred patentability on a scientific truth and its mathematical expression. Such a judicial determination is contrary to the constitutional purpose of the Patent System, and calls for a reaffirmance of the vitality of the principle so often stated by this Court and by inferior courts that patents cannot issue for the discoveries of phenomena of nature.

More particularly, the Court below reversed[1] the Patent Office's adherence to this sound principle, and held patentable claims 8 and 13 of the Benson and Tabbot patent application[2] for a method comprising a series of mathematical operations for converting numerical information from a binary coded decimal number form into a true binary number form.[3]

1. The decision below is reported, 441 F. 2d 682, 58 C.C.P.A. (Pat.) 1134 (1971).

2. The application by respondents as inventors was filed in the U. S. Patent Office on October 9, 1963 and bears Serial No. 315,050.

3. Petitioner's Brief for Certiorari at 3-7.

III.
INTEREST OF AMICUS CURIAE.

Honeywell Inc. (Honeywell) has both a private and a representative public interest in the outcome of this case.

Honeywell views its overall business as being primarily related to the manufacture and marketing of automation equipment and systems. For example, such systems frequently incorporate electronic computers which are intended to be used in varying ways for the handling and manipulation of information or data for business and process control purposes.

Like the abacus of the ancients, the mechanical calculator of the industrial revolution, or the pocket slide rule of the student scientist and the engineer of today, the modern electronic computer is for all practical purposes nothing more or less than an aid to computation. In other words, the computers provided by Honeywell and the other computer manufacturers to their customers are but tools awaiting specific direction from a computer program. Where, for example, a computer program is written to convert binary coded decimal (BCD) information into true binary information, the Benson and Tabbot claims become most relevant.[4] The mere operation of a computer under the

4. The computers manufactured by Honeywell use information represented in various so-called binary forms; that is, as a sequence of "ones" and "zeros". Numerical business data is generally expressed in conventional decimal form; that is, as a sequence of any of the numerals 0, 1, 2, . . . 9. A computer may be directed to represent any conventional decimal number as a binary sequence of "ones" and "zeros". For example, the docket number of this case, 485, can be expressed as a binary form of 4, followed by a binary 8 and a binary 5: 0100, 1000, 0101 (in binary coded decimal or so-called "BCD" notation). That same number can also be

control of the program may constitute an infringement of such claims, if such program is determined to be patentable. This is so even though the computer itself may have been constructed and operated with many other types of programs long prior to the claimed discovery of Benson and Tabbot.

When a private patent monopoly is granted pursuant to the Constitution, it is prerequisite that the public interest in such exclusive rights also be duly regarded. This case raises the question whether or not a private interest in a mathematical method such as that of Benson and Tabbot is consistent with the public interest in the free use of any scientific principle or intellectual concept. Both manufacturers and users of computers which, *per se*, are free of patent infringement, will suffer an unknowable business burden if those same non-infringing machines become infringing ones merely by reason of being controlled by any of the infinite variety of programs which such computers are inherently designed to use. A mathematical method, *per se*, should not become a patent infringement by reason of being used on an unpatented computer.

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expressed in so-called true binary notation as 111100101. Thus, 485 equals 0100, 1000, 0101 equals 111100101, and any expression of a number in one notation may be converted for convenience of computer use to any other form of notation. The converting of information in BCD form into true binary form may be done in various ways, including the method of Benson and Tabbot. The decision below, 441 F. 2d at 683, 56 C. C. P. A. (Pat.) at 1136.

IV.

THE CONSTITUTIONAL PROVISION.

Art. I, § 8, cl. 8 of the Constitution of the United States provides:

"The Congress shall have power. . . .

* * * * *

To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries."

V.

THE CONGRESSIONAL ENACTMENTS.

The Congress has enacted legislation under the limited power granted in Art. I, § 8, cl. 8 of the Constitution, by providing statutory protection for the discoveries of inventors in the useful arts in Title 35, United States Code, and for the writings of authors in science in Title 17, United States Code.

VI.

ARGUMENT.

The Background of This Case Deals with Numbers.

The Benson and Tabbot method of claims 8 and 13 is not a discovery which promotes the useful arts within the constitutional purpose.

The complexities of technical language which burden this case tend to obscure its straightforward realities. The subject matter here is characterized by numbers, as expressions of information, and by the arbitrary symbols of mathematics for recording and manipulating numbers. We are dealing, simply enough, with the language of numbers.

Within the privacy of the human mind, man reasons. He perceives natural truths and defines philosophy. Mathematics is a means for the outward expression of his philosophy. The thoughts of one man can be communicated to and can become the thoughts of others. Mental concepts find their expression and are transferred through the symbols and sounds of language. Mathematics, as a philosophy produced by the reasoning of the human mind, finds its real expression in a language of many "dialects": *inter alia*, Roman numerals, Arabic decimal numbers, and binary digits.

It is the peculiar simplicity of binary digits, as a language dialect of only two symbols, one and zero, and the facility of the electronic computer to handle such digits in vast quantities at incredible speeds, that has made the binary "dialect" of mathematical language a powerful way to manipulate and communicate information. This language dialect can serve to express information as varied as the human intellect can conceive, whether, for example, it be

numbers to represent scientific data, the letters of the alphabet and other symbols to represent a combination of words, or a combination of mixed numbers, letters and symbols to represent the business facts of bank balances and names. Binary numbers can and do symbolize all of these forms of information.

Benson and Tabbot perceived a natural truth found in the mathematical relationship between information expressed in binary coded decimal (BCD) form, a mathematical "dialect", and the same information expressed in yet another mathematical "dialect" of true digital binary form. Benson and Tabbot expressed what they had perceived in the ordinary, written English language found in the description and claims of their patent application Serial No. 315,050. In words, they defined their discovered mental concept as a series of mathematical steps or operations for converting or translating information expressed in BCD form, in accordance with their discovered mathematical relationship, into true binary form.

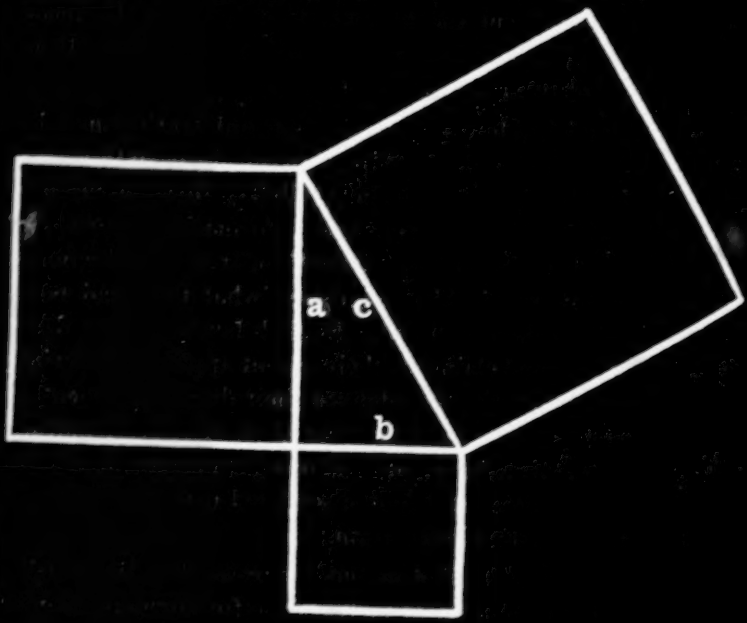
The Benson and Tabbot method, expressed in the words of patent claims, is a set of instructions for communicating the mental concept of their discovered mathematical relationship. The mathematical "dialect" of BCD becomes translatable into the mathematical "dialect" of true binary numbers. To be sure, other mental concept methods of converting or translating BCD numbers into true binary numbers were previously known, but were based on other mathematical relationships perceived and expressed by others.[5]

In the sixth century B. C., the Greek philosopher Pythagoras perceived the natural or scientific truth of an orderly and predictable relationship between the two sides and the hypotenuse of a right angle triangle.[6] By drawing geo-

5. The decision below, 441 F. 2d at 683, 58 C.C.P.A. (Pat.) at 1136.

6. 18 Encyclopaedia Britannica 905-07 (1971).

metric squares upon each of the dimensions of such a triangle, the discovered truth can be presented in visual form:



The discovered truth was that the area of the two smaller squares formed on the sides of the triangle is equal in area to the square formed on the hypotenuse of the triangle. It then became possible to express this mental concept discovery in the symbolic language of mathematics, as an equation:

$$a^2 + b^2 = c^2$$

now known to every student of geometry or algebra as the Pythagorean Theorem.

Just as the truth perceived by Pythagoras in the relationship between the sides of a triangle can be expressed in the symbolic language of mathematics, so too the truth perceived by Benson and Tabbot in a particular relation-

ship between BCD and true binary numbers can be expressed in the symbolic language of mathematics. The sequence of English-word "steps" defined by the Benson and Tabbot claims 8 and 13 is simply a set of instructions for using the natural mathematical relationship by performing a series of mathematical operations to convert numerical information from a BCD number form into a desired true binary number form. In exactly this same way, the Pythagorean discovery can find its further expression in a set of instructions for using the natural mathematical relationship by performing a series of mathematical operations to convert known numerical information about two of the sides of a triangle into desired information about the third side. For example:

> I claim the method of determining the hypotenuse of a triangle, which comprises the steps of:
>
> 1. testing the angle of the triangle opposite the hypotenuse;
> 2. if the angle is equal to 90 degrees, measuring one side of the triangle and storing the measurement;
> 3. measuring the other side of the triangle, and storing the measurement;
> 4. multiplying the measurement of said one side by itself, and storing the product;
> 5. multiplying the measurement of said other side by itself, and storing the product;
> 6. adding the product of step 4 to the product of step 5;
> 7. computing the square root of the sum of step 6; and
> 8. storing the result of step 7.

Can it be said that a novel set of instructions for the mathematical manipulation of Pythagoras' equation, or for the mathematical conversion of BCD to true binary numbers, is susceptible to patenting?

It shall be the purpose of this brief amicus curiae to demonstrate that no man is entitled to a monopoly which restricts the full freedom of other men's minds to share scientific or philosophical truths. The common property of mankind cannot be patented.[7] The perception by Benson and Tabbot of a particular mathematical relationship, which permits a translation between two of the language dialects of the binary arithmetic peculiar to computers, cannot justify a patent monopoly in the language expression of that perception as a claimed set of instructions for communicating and using their mental concept. It is urged that such subject matter is no more patentable than is the expression of any scientific or philosophical truth which, in the future, may be newly perceived or discovered.

The Mere Language Expression of a Mathematical Truth Is Not a Constitutionally "Useful Art".

Art. I, § 8, cl. 8 of the Constitution is "both a grant of power and a limitation", and in particular, "is limited to the promotion of advances in the 'useful arts.'"[8] No

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7. As stated by the court in Detmold v. Reeves, 7 F. Cas. 547 (No. 3,831) (C.C.E.D. Pa. 1851):

"The more comprehensive truths of all philosophy, whatever specific name we give to them, cannot be specially appropriated by any one. They are almost elements of our being. We have not reasoned them out, perhaps, and may be even unconscious of their action; yet they are about us, and within us, entering into and influencing our habitual thoughts and pursuits, and modes of life—contributing to our safety and happiness. And they belong to us as effectively as any of the gifts of Heaven. If we could search the laws of nature, they would be, like water and air, the common property of mankind; and those theories of the learned which we dignify with this title, partake, just so far as they are true, of the same universally diffused ownership. It is their application to practical use which brings them within the domain of individuals; and it is the novelty of such an application that constitutes it the proper subject of a patent." 7 F. Cas. at 549

8. Graham v. John Deere Co. of Kansas City, 383 U. S. 1, 5 (1966).

matter how important or beneficial to the public, the Benson and Tabbot method still must be a process *in the useful arts* in order to constitute patentable subject matter.[9] The "beneficent and imposing character of the discovery can not change the legal principles upon which the law of patents is founded."[10]

In the eighteenth century, the phrase "useful arts" meant the practical arts or the trades: the activities and physical things which are more of the hands and body than of the mind, as opposed to the liberal or fine arts.[11]

Before our own patent system, the English patent statute[12] drew a clear line of distinction between "manufactures" which produced physical effects by physical forces and were patentable, and the other inventive subject matter for which no protection was provided.[13] In the first United States patent statute, Congress recognized the same distinction in the enumeration of the subject matter for which patents might be granted.[14]

The Constitutional clause, Art. I, § 8, cl. 8, draws a clear

9. "Epoch-making 'discoveries' of 'mere' general scientific 'laws' without more cannot be patented. So the great 'discoveries' of Newton or Faraday could not have been rewarded with such a grant of monopoly." Katz v. Horni Signal Mfg. Corp., 145 F. 2d 961 (2d Cir. 1944), *cert. denied*, 324 U. S. 882 (1945).

10. Morton v. New York Eye Infirmary, 17 F. Cas. 879, 883 (No. 9865) (C.C.S.D. N.Y. 1862).

11. Coulter, The Field of the Statutory Useful Arts, Part III, 34 J. Pat. Off. Soc'y. 718, 733-36 (1952); Coulter, The Field of the Statutory Useful Arts, Part II, 34 J. Pat. Off. Soc'y. 487, 495-500 (1952); and Noah Webster, American Dictionary of the English Language (1848 ed.). *See* Hotel Security Checking Co. v. Lorraine Co., 160 F. 467, 469 (2d Cir. 1908).

12. Statute Against Monopolies, 21 Ja. I. ch. 3 (1623).

13. 1 Robinson, Law of Patents § 69 (1890).

14. *Id.* The Act of 1790, ch. 7, 1 Stat. 109, was entitled: "An Act to Promote the Progress of Useful Arts", and enumerated patentable subject matter as an "art, manufacture, engine, machine or device, or any improvement thereon".

distinction between the tangible realities of the "useful arts" and the intellectual expressions of thought in "science".[15] The clause itself is a balanced sentence, common in eighteenth century writing:

Science — Authors — Writings
Useful arts — Inventors — Discoveries[16]

At the time of the drafting of the Constitution, the word "science" meant learning in general, in the common context of "government, religion, morality, and every other science."[17]

Does the Benson and Tabbot discovery fall within the constitutional intendment of "useful arts"? Benson and Tabbot did two things: first, they discovered the natural truth or law with respect to a particular relationship existing between BCD and true binary number expressions of the same information; and, second, they expressed that relationship in patent claim wording as an algorithm[18] or set of instructions for manipulating one number form into another in accordance with the discovered relationship.

As to the first, their discovery itself, the mere perception of a phenomenon of nature is not patentable subject mat-

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15. *See* Graham v. John Deere Co. of Kansas City, 383 U. S. 1, 5 n. 1 (1966); and Lutz, A Clarification of the Patent Clause of the U. S. Constitution, 18 Geo. Wash. L. Rev. 50 (1949).

16. Lutz, *supra* note 15, at 58.

17. Letter to Elbridge Gerry (January 26, 1799), IX The Writings of Thomas Jefferson, at 78 (Lipscomb & Bergh ed.).

18. An algorithm has been defined as:

> "A prescribed set of well-defined rules or processes for the solution of a problem in a finite number of steps, e.g., a full statement of an arithmetic procedure for an evaluation, to a stated degree of precision."

American National Standards, Inc., No. ANSI, X3.12-1970, American National Standard Vocabulary of Information Processing, at 12 (1970).

ter.[19] In other words, Benson and Tabbot's act of discovery, no matter how immensely useful and important in the world of science, business or commerce, cannot in and of itself be patentable.

"While a scientific truth, or its mathematical expression is not patentable invention, a novel and useful structure created with the aid of knowledge of scientific truth may be. Mackay Radio & Telegraph Co. v. Radio Corp., 306 U. S. 86 at page 94, 59 S. Ct. 427, 83 L. Ed. 506. He who discovers a hitherto unknown scientific fact or law of nature has no claim to a monopoly of it; if there is to be invention from such a discovery it must come from the application of the law of nature or scientific fact to a new and useful end. Funk Brothers Seed Company v. Kalo Inoculant Company, 333 U. S. 127, 68 S. Ct. 440, 92 L. Ed. 588. See also DeForest Radio Company v. General Electric, 283 U. S. 664, 685, 51 S. Ct. 563, 75 L. Ed. 1339; Wall v. Leck, 9 Cir., 66 F. 552, 555; In re Modine, 57 F. 2d 355, 356, 19 C. C. Pa., Patents 1058. Discovery of a previously unknown law of operation, involved in no new method, has never been held to be invention. The application of the

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19. *E.g.*, Funk Bros. Seed Co. v. Kalo Inoculant Co., 333 U. S. 127 (1948) wherein Mr. Justice Douglas, speaking for the Court, stated:

"For patents cannot issue for the discovery of the phenomena of nature. See Le Roy v. Tatham, 14 How. 156, 175, 14 L. Ed. 367. The qualities of these bacteria, like the heat of the sun, electricity, or the qualities of metals, are part of the storehouse of knowledge of all men. They are manifestations of laws of nature, free to all men and reserved exclusively to none. He who discovers a hitherto unknown phenomenon of nature has no claim to a monopoly of it which the law recognizes. If there is to be invention from such a discovery, it must come from the application of the law of nature to a new and useful end. See Telephone Cases, 126 U. S. 1, 532, 533, 8 S. Ct. 778, 780, 781, 31 L. Ed. 863; DeForest Radio Co. v. General Electric Co., 283 U. S. 664, 684, 685, 51 S. Ct. 563, 568, 569, 75 L. Ed. 1339; Mackay Radio & Tel. Co. v. Radio Corp., 306 U. S. 86, 94, 59 S. Ct. 427, 431, 83 L. Ed. 506; Cameron Septic Tank Co. v. Saratoga Springs, 2 Cir., 159 F. 453, 462, 463." 333 U. S. at 130.

law must be novel and inventive in character. Luten v. Whittier, 6 Cir., 251 F. 590; General Electric Co. v. Cooper Hewitt Electric, 6 Cir., 249 F. 69." Davison Chem. Co. v. Joliet Chemicals, Inc., 179 F. 2d 793, 794-95 (7th Cir. 1950), *cert. denied*, 340 U. S. 816 (1950).

As to the second, the expression by Benson and Tabbot of instructions for manipulation of the natural relationship of the two number forms so as to convert one mathematical language "dialect" to another, is nothing more or less than a part of the "science" of mathematics. As such, claims 8 and 13 do not relate to a useful art[20] and cannot be the subject of a patent monopoly because they are outside the limited power of the Congress to grant such monopoly rights.[21]

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20. The Court below concluded that the Benson and Tabbot method was a useful art by reason of the fact that the method could be used in connection with the operation of a machine, namely, a computer. 441 F. 2d at 687, 688, 58 C.C.P.A. (Pat.) at 1142, 1143. The issue, however, is whether the method, in and of itself, is a useful art; not whether the computer is a useful art. *Cf.* Brenner v. Manson, 383 U. S. 519 (1966). This is particularly true since admittedly the Benson and Tabbot method can be performed by a human being utilizing "any kind of writing implement and any kind of recording medium—'pencil and paper'." 441 F. 2d at 688, 59 C.C.P.A. (Pat.) at 1143. In other words, the fact that a set of musical instructions contained on a sheet of music, or punched as holes into a roll of paper, will enhance the manual or automatic operation or playing of a piano, which admittedly is a machine in the useful arts, does not render the set of musical instructions patentable subject matter, nor the piano a new machine when being so played. *See* Baker v. Selden, 101 U. S. 99 (1880).

21. *See* Detmold v. Reeves, 7 F. Cas. 547, 549 (No. 3831) (C.C.E.D. Pa. 1851). ("He who devised the art of multiplication could not restrain others from using it after him, without paying him for a license"); and *Ex parte* Meinhart, 1907 Dec. Com. Pat. 238, 239, 129 O. G. Pat. Off. 3503 (1907) ("It is conceivable that some person after long and arduous study might discover a new method for solving certain mathematical problems which was much simpler and shorter than any known method; but such method would not be a proper subject for a patent").

The Algorithm of a Newly Discovered Mathematical Truth Cannot Be "Unobvious" in the Statutory Patent Sense.

In its decision below, the Court noted that "no question is raised as to . . . unobviousness" of the Benson and Tabbot claims.[22] To the contrary, it is urged that the issue of unobviousness is inherent in the question now before the Court.

The mere language expression of a newly discovered mathematical relationship cannot satisfy the statutory requirement for "unobviousness". Once given a natural truth or law, any algorithm[23] of the truth or law is "obvious" within the meaning of Section 103 of the Patent Statute.[24]

An electronic digital computer of the programmable type is predetermined by its design and construction to perform a fixed number of distinct operations, sometimes referred to as "instructions". Typical instructions are such mathematical method steps as ADD, SUBTRACT, MULTIPLY, DIVIDE, SHIFT, and TRANSFER. Once a particular computer has been constructed, the type of instructions which it is capable of performing are fixed, even though the sequence in which those instructions may be utilized is in-

22. The decision below. 441 F. 2d at 684, 58 C.C.P.A. (Pat.) at 1137.

23. A definition of the term "algorithm" is set forth in note 18, *supra*.

24. 35 U. S. C. § 103 (1952) provides:

"Conditions for patentability; non-obvious subject matter
A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made."

finitely variable.[25] A programmer seeking to control the operation of that computer will author or compose a program, first in a general way by setting forth the desired performance objectives in relatively broad terms as an algorithm, and then in more detailed terms as a series of step-by-step instructions for the computer. An example of just such an algorithm, capable of being further expressed as a series of instructions or as a "program" for a computer,[26] is found in either of the Benson and Tabbot claims 8 and 13.

The Benson and Tabbot method or algorithm cannot fulfill the most fundamental prerequisite for patentability: unobviousness.[27] Persons having ordinary skill in the mathematical arts, including the art of programming digital computers, are charged with constructive knowledge of the particular natural relationship between numerical information in BCD form and in true binary form, which was dis-

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25. The computer is susceptible for use with an infinite variety of program instruction sequences for the purpose of carrying out any of the functional or computational needs of the user. The author of a program may be the creator of a "writing" which by reason of its originality promotes the progress of "science", as contemplated by the Constitution. The fact that proprietary protection under the copyright statutes is different from that under the patent statutes, and the fact, that some may consider copyright not to be an effective and practical form of protection for computer programs, does not alter the fundamental nature of a computer program as an authored work protectible as a monopoly only under what Congress provides by way of statutory copyright protection. *See, e.g.*, Bunkman, Protection of Proprietary Interest in Computer Programs, 51 J. Pat. Off. Soc'y. 135, 136 (1969); and Bender, Computer Programs: Should They Be Patentable?, 68 Colum. L. Rev. 241, 248-50 (1968).

26. "To illustrate the entire procedure in detail a representative program is set forth in the table for converting a two-digit binary coded decimal number to ordinary binary." Benson and Tabbot application S. N. 315,050, Record, at ——.

27. 35 U. S. C. § 103 (1952).

covered by Benson and Tabbot.[28] In other words, given the particular natural truth or law discovered by Benson and Tabbot, no inventive act can exist in expressing that mathematical concept as either the Benson and Tabbot method or, indeed, any other algorithmic expression of it. The creation of any such algorithms would be obvious to a person having ordinary skill in the mathematical arts.[29]

The Patenting of Computer Programs Will Raise Unsolvable Practical Problems for the Computer Industry.

Since the modern electronic computer utilized in automation systems is for all practical purposes nothing more or less than an aid to computation, the computers provided by manufacturers to their customers are but tools awaiting specific direction from a computer program.

As a manufacturer and user of computers, Honeywell is opposed to the granting of patent claims covering computer programs. Under the present statute,[30] the mere operation of an unpatented computer, under the control of a program, may constitute an infringement of such claims. This is so even though the computer itself may have been constructed and operated with many other types of programs long prior to the granting of program patent claims.

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28. Funk Brothers Seed Company v. Kalo Inoculant Co., 333 U. S. 127, 131-32 (1948); O'Reilly v. Morse, 56 U. S. (15 How.) 62, 115 (1853); Templeton Patents, Ltd. v. J. R. Simplot Co., 336 F. 2d 261, 264 (9th Cir. 1964); Davison Chem. Corp. v. Joliet Chemicals, Inc., 179 F. 2d 793, 795 (7th Cir. 1950), *cert. denied*, 340 U. S. 816 (1950); Loew's Drive-In Theaters v. Park-In Theaters, Inc., 174 F. 2d 547, 551 (1st Cir. 1949), *cert. denied*, 338 U. S. 822 (1949); and A. & E. Pitman Mfg. Co. v. Pitman, 37 F. 2d 582, 583 (D. Mass. 1930), *aff'd.*, 50 F. 2d 744 (1st Cir. 1930).

29. Cases cited note 28, *supra*.

30. 35 U. S. C. § 271 (1952).

There are practical problems associated with the granting of patent protection which covers computer programs. A user of a computer designed to operate under program control will certainly know if he has wrongfully copied from the work of another. However, when a user independently creates or authors a new program, he has no reasonable way to determine if someone else has previously authored that same program. He cannot make this determination by even the most diligent search in the Patent Office. The Commissioner of Patents acknowledges that the Patent Office itself cannot make reliable searches in connection with the required examination of applications for patent on such subject matter.[31] Despite the inadequacy of the search and examination procedure the user will face a statutory presumption of validity[32] with respect to any patent covering a computer program, regardless of the form in which the subject matter may be claimed. The resulting burden upon the public and the courts that arises from the ambiguities and uncertainties of patents covering mental processes and scientific principles, such as the Benson and Tabbot claims seek to cover, will raise a grave risk of discouraging the continued competitive growth of the important information systems or computer industry.

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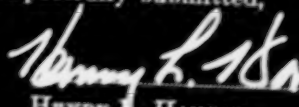
31. The reasons are set forth in Petitioner's Brief for Certiorari at 14.

32. 35 U. S. C. § 282 (1952).

CONCLUSION.

The expression of a newly perceived scientific or philosophical truth is the common property of mankind and is not within the definition of the patentable useful Arts as intended by the Constitution. The natural truth expressed in a method for converting numerical information from one mathematical dialect to another, regardless of the form of its expression in words or symbols, cannot be patented. The method of Benson and Tabbot claims 8 and 13 does not promote the progress of useful Arts pursuant to the grant of power and limitation of the Constitution. The decision below should be reversed.

Respectfully submitted,



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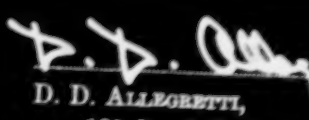

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IN THE

Supreme Court of the United States

OCTOBER TERM, 1971

No. 71-485

ROBERT GOTTSCHALK, COMMISSIONER OF PATENTS,
Petitioner,

v.

GARY R. BENSON AND ARTHUR C. TABBOT,
Respondents.

On Writ of Certiorari to the
United States Court of Customs and Patent Appeals

BRIEF FOR AMICUS CURIAE INTERNATIONAL BUSINESS MACHINES CORPORATION

QUESTION PRESENTED

Whether a novel method of arithmetical calculation that normally, but not necessarily, is performed by a computer is a patentable process.

INTEREST OF AMICUS CURIAE

International Business Machines Corporation (IBM) has received consent from both parties to file this brief

amicus curiae. The letters of consent have been filed with the Clerk of the Court.

IBM is a corporation organized under the laws of the State of New York. IBM's business involves the development, manufacture, and marketing of a wide range of electronic data processing equipment; the development and marketing of computer programs; the manufacture and marketing of office equipment such as typewriters, dictating equipment, and copying equipment; and the provision of various associated services.

The development and availability of innovative computer programming is of particular importance to a computer manufacturer because it increases the utilization of computers. Research in the use of mathematical or computational techniques is also of great importance to computer manufacturers because many significant uses of computers, for example in the study of atomic physics and in space exploration, derive from breakthroughs in mathematics that most practically can be performed only with the aid of a computer. An interpretation of the patent statute that permitted patent protection to extend to mathematical or computational techniques would have the inevitable effect not only of stifling developments in computer programming, but of slowing developments in fields dependent upon computer programming as well.[1]

The interest of amicus curiae is to deal with four aspects of the question presented in this case that are of particular importance: first, the practical restrictive effect of issuing patents on computer programs; second, the reasons why computer programs do not fit the statutory standard with respect to the patentability of a

[1] IBM has no interest in the patent that would be issued to respondents Benson and Tabbot because that patent would be owned by Bell Telephone Laboratories and IBM would be licensed under any such patent pursuant to the terms of an existing license agreement between Western Electric Company and IBM.

process; third, the decisions made in other countries with respect to whether computer programs are patentable; and fourth, the availability of other and more appropriate protection for the proprietary interest in computer programs through copyright.

SUMMARY OF ARGUMENT

Patents issued on computer programs will extend patent protection far beyond any current limits and will inevitably permit the patenting of mathematical techniques, scientific principles and other abstract concepts or rules. A computer program is simply a mode of expressing ideas. The logical solution to a problem may appear as a writing in a book, or in mathematical notation form, or in a form of machine language that can be utilized by a computer. However, the essence is the same. The invention or discovery contained in a computer program must reside in the principle, rule or mathematical technique that is expressed and therefore the program is not patentable subject matter.

Further, in carrying out the instructions in a computer program the computer itself operates entirely as it was designed and built to operate. The only contribution of the program is to set out a specific sequence of steps for the computer to perform. The performance of each of the individual steps is a capability fully intended and contemplated by the designer of the computer and varying the sequence in which these steps are performed does not vary the actual nature of the operation of the computer so as to constitute a patentable invention.

Other countries where there has been a rapid increase in the development and utilization of computer technology have also faced this question. In nearly every such country the decision has been against extending patent protection to computer programs.

Finally, the copyright statute provides one appropriate form of protection for the proprietary interests in computer programs, and other forms of protection specially tailored for computer programs are presently under consideration.

ARGUMENT

Introduction

This is a landmark case in the history of the American patent system. It has been nearly 100 years since this Court fashioned the basic standard governing the patentability of a process. *Cochrane* v. *Deener*, 94 U.S. (4 Otto) 780 (1877). That standard proved entirely serviceable, and during the succeeding years only seven cases involving the question of what constitutes a patentable process reached this Court.[8]

However, the development and enormous growth of an entirely new technology in general purpose digital computers and computer programming has produced a new, and, for the court below, an irresistable pressure on the standard enunciated in *Cochrane* and its progeny. This new technology is unlike any that have come before. Other revolutionary technological developments essentially have subetituted for and greatly extended man's physical capabilities. The new mechanical, chemical and electrical processes that were devised to achieve physical results could readily be perceived and defined within the existing standards of the patent system. But the developments achieved in the computer field, particularly in computer programming, have subetituted for and greatly extended man's

[8] *Tilghman* v. *Proctor*, 102 U.S. (12 Otto) 707 (1881); *New Process Fermentation Co.* v. *Maus*, 122 U.S. 413 (1887); *The Telephone Cases*, 126 U.S. 1 (1888); *Risdon Iron & Locomotive Works* v. *Medart*, 158 U.S. 68 (1895); *Westinghous* v. *Boyden Power Brake Co.*, 170 U.S. 537 (1898); *Expanded Metal Co.* v. *Bradford*, 214 U.S. 366 (1909); *Funk Brothers Seed Co.* v. *Kalo Inoculant Co.*, 333 U.S. 127 (1948).

mental capabilities in organizing known information and in solving mathematical problems. Computer programming developments present, therefore, the basic question whether a new method for organizing information or for solving a mathematical problem may be patented as a process merely because the method can be performed by a computer.

The court below chose to meet this challenge by abandoning instead of interpreting and applying the principles declared by this Court in its prior decisions. The Patent Office rejected the Benson and Tabbot patent application because the process described was simply a method of manipulating mathematical symbols. Record at 140. The court below reversed, declaring the standard of patentability used by the Patent Office was inapplicable and no longer the law. *Application of Benson*, 441 F.2d 682 (C.C.P.A. 1971). *See also Application of Prater*, 415 F.2d 1393 (C.C.P.A. 1969); *Application of Bernhart*, 417 F.2d 1395 (C.C.P.A. 1969); *Application of Mahony*, 421 F.2d 742 (C.C.P.A. 1970); *Application of Musgrave*, 431 F.2d 882 (C.C.P.A. 1970); *Application of Foster*, 438 F.2d 1011 (C.C.P.A. 1971); *Application of McIlroy*, 442 F.2d 1397 (C.C.P.A. 1971); *Application of Waldbaum*, 173 U.S.P.Q. 430 (decided April 20, 1972). The consistent departure, in this line of cases, from the standard declared by this Court to be applicable to all process patent claims is unsupported either by the law or the facts.

In Part I of this brief we seek to focus on the practical effect of patents issued on computer programs. Part II reviews the development, through case law of this and other courts, of a standard to be met by patents issued on processes and analyzes the reasons why this standard should be applied undiminished to the field of computer programming. Part III summarizes the experience of other countries in dealing with the question whether computer programs are patentable. Part IV

analyzes the protection available for proprietary rights in computer programs through copyright and the present legislative proposals for specially tailored protection for proprietary rights in computer programs.

I. PATENTS ISSUED ON METHODS FOR PROGRAMMING COMPUTERS WOULD INEVITABLY CONSTITUTE BARRIERS TO THE DEVELOPMENT AND USAGE OF MATHEMATICAL AND SCIENTIFIC PRINCIPLES.

A. Respondents' Discovery Is a Method for Programming a Computer.

What the respondents have sought to patent is a computer program. It was so described by the Patent Examiner,[3] the Patent Office Board of Appeals,[4] and the court below,[5] and would be so described as a practical matter by anyone versed in the computer field.[6]

A computer program is most simply defined as "a series of instructions or statements, in a form acceptable to a computer, prepared in order to achieve a certain result."[7] The Benson and Tabbot patent application itself described the invention in just such terms:

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[3] Record at 18.

[4] Record at 140-141.

[5] *Application of Benson*, 441 F.2d 682, 683 (C.C.P.A. 1971).

[6] *See e.g.*, trade press reports on this case: *Software Patent Case Going to Supreme Court*, 17 DATAMATION 54 (November 1, 1971); Spaeth, *High Court Seen Likely to Reject Patents*, Computerworld, December 8, 1971, at 1, 6; *Patents on Computer Programs An Open Issue*, Weekly Report to the Electronic Industries, April 26, 1971, at 1; *Program Patents to High Court*, Computerworld, August 25, 1971, at 6; *Software Patent Faces Jeopardy*, Computerworld, October 13, 1971, at 9.

[7] American National Standards Institute, American National Standard Vocabulary for Information Processing at 30 (February 1970). Other definitions formulated include these essential elements. *See e.g.*, Comment, *Computer Program Protection: The*

"This invention relates to the processing of data by program and more particularly to the programmed conversion of numerical information. A program is a set of instructions for processing data in a preassigned fashion." [8] Record at 3.

The respondents' claims do not describe a particular make or model of computer with which their discovery must be used. Nor do they describe any new and unobvious machinery to be added to or used in conjunction with a particular computer. They merely recite a series of the conventional operations that can be performed by any general purpose digital computer in carrying out the steps that constitute their alleged discovery. The invention at issue is not the computer, nor any part of the computer. The invention is merely a plan, method or series of steps set out for resolution of a particular problem, which can be executed using the available capabilities of an existing computer. In other words, the invention is a computer program.

The respondents' discovery can more precisely be described as a mathematical algorithm that may be em-

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Need to Legislate a Solution, 54 CORNELL L. REV. 586 (1969); Bender, *Computer Programs: Should They Be Patentable*, 68 COLUM. L. REV. 241 (1968); Note, *Computer Programs and Proposed Revisions of the Patent and Copyright Laws*, 81 HARV. L. REV. 1541 (1968); Note, *Process Patents for Computer Programs*, 56 CALIF. L. REV. 466 (1968).

[8] The letters and numbers with which respondents set out their instructions, *e.g.*, STC 4; CGT, ADR x DR (see Record at 9), are in a form acceptable to a computer. This is a way of using letters and numbers to represent the arrays of ones and zeroes to which the computer responds. These instructions are written by the programmer and punched onto cards by a keypunch operator. Then the instructions on the cards are translated automatically into "machine language" by an assembler. Actual machine language is an array of ones and zeroes which correspond to the presence or absence of electrical signals in the machine. The number one represents an electrical pulse and the number zero represents no electrical pulse.

bodied in a computer program. An algorithm is the general plan or set of rules for the solution of a problem and may or may not be written in a form immediately acceptable to a computer. It is generally closer to plain English than to machine language. The term algorithm is preferred by some writers because of its apparent ease of definition.[9] However, what is at issue in this case is the whole spectrum of writings or things that are part of computer programming and the issue of patentability *vel non* is the same with respect to all of them—whether written in plain English or in a series of 1's and 0's. Therefore, the more general term computer program is used herein.

All computer programs are based upon some mathematical technique, logical procedure, or algorithm and contain a series of detailed instructions for carrying out this mathematical technique or algorithm. Devising a new mathematical principle or algorithm for use in a program can involve a high level of expertise, creativity and judgment. After the mathematical technique or algorithm has been developed, someone must write or set out the specific series of instructions that will cause the computer to follow the desired algorithm. This second part of the task is generally termed coding. During this procedure a programmer takes a certain limited number of operations that can be performed by a machine and he chooses and arranges this limited number of operations in a sequence so that the desired problem may be solved. Writing this series of machine instructions does not involve any significant creativity. *See* H. Goldstine and J. Von Neumann, *Planning and Coding of Problems for an Electronic Computing Instrument*, 5 COLLECTED WORKS OF JOHN VON NEUMANN 80 (A. Taub ed. 1968).

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[9] *See e.g.*, Breyer, *The Uneasy Case for Copyright: A Study of Copyright in Books, Photocopies, and Computer Programs*, 84 HARV. L. REV. 281, 341 (1970).

Respondents' computer program directs the computer in accordance with a mathematical technique for converting numbers of one type into numbers of another type. There are various ways that numbers can be represented. The numbers that we normally utilize are structured around the base number "ten". The biquinary numbering system used by the Chinese and Japanese is structured around the base numbers "two" and "five". The numbering system that the ancient Babylonians used is structured around the base number "sixty".[10] Digital computers generally operate upon numbers in the binary or base "two" numbering systems or in some related numbering system such as the binary coded decimal (BCD) system. These same computers can be made to operate on numbers in almost any of the other numbering systems; however, they may be less efficient when operating on numbers expressed in a form other than that which they were primarily designed to utilize.

Any number can be represented in any one of the various numbering systems that have been devised, and a variety of rules, principles or algorithms to convert from one numbering system to another numbering system have been developed by mathematicians through the ages. These rules, principles or algorithms are generally described in terms of execution by hand with pencil and paper or with the aid of a computation device such as a slide rule or desk calculator. They are found in many standard mathematics textbooks.[11]

The respondents' patent application describes one way of converting numbers from the binary coded deci-

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[10] A. AABOE, EPISODES FROM THE EARLY HISTORY OF MATHEMATICS (1964).

[11] *E.g.*, M. ROSSKOPF, MODERN MATHEMATICS FOR JUNIOR HIGH SCHOOLS, Book I, p. 35 (1961) (conversion of decimal numbers into binary numbers); H. JACOBOWITZ, COMPUTER ARITHMETIC 62 (1962) (conversion of binary numbers into ternary, octal and hexadecimal numbers); A. BAKST, MATHEMATICAL PUZZLES AND PASTIMES 56-69 (1954) (conversion of Roman numerals into decimal and biquinary numbers).

mal system to the binary system. The rule, principle or algorithm involved is the repeated addition of the binary digits 101 at certain specified points.[12] As described in respondents' patent application, this rule, principle or algorithm is executed by a computer through a specified computer program.[13]

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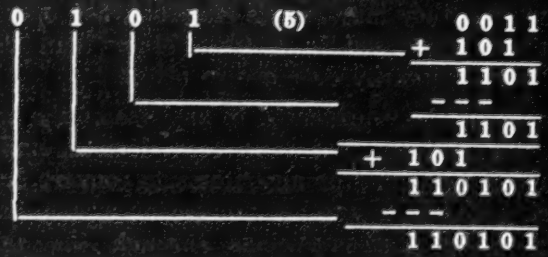
[12] Under the binary coded decimal system the number 58 would be represented by two binary numbers, one for each digit—0101 representing 5 and 0011 representing 8. This representation can be converted to the binary system representation of the number 58, which is 110101, by adding the binary digits 101 in successive positions each time the digit 1 appears in the higher order positions. The principle involved is most simply set out by respondents' description of the execution of the principle by hand, Record at 23:

"The example used in the specification can be done by hand as follows:



[13] The actual sequence of instructions performed by a computer in order to carry out the above algorithm is set out by respondents as follows (Record at 9-11):

Address	Instruction	Comment (extracted from text)
108	STC 4	store the "index" number 4
109	CGT ADR x DR	transfer the number to be converted from storage to a working location
110	SHR 3	shift number right 3 places
111	2BT 114	test second bit of number
112	SHR 1	shift number right 1 place
113	TRA 119	transfer
114	SSB 0	set second bit to 0
115	AD1 DR	add "1"
116	SHL 2	shift left
117	AD1 DR	increment by "1"
118	SHR 3	shift right
119	TIX 111	decrease the index number
120	SHR 1	shift right

In the court below, respondents stated that they had "*discovered that a very simple relationship exists* between the digits of the BCD number to be converted and the equivalent binary number when the conversion process is broken down into its most elementary steps. In addition, this relationship is identical for all BCD digits. Hence simple repetitive action can be used to accomplish the entire conversion." [14] (Emphasis added.)

Once respondents found or recognized the particular mathematical relationship between binary numbers and binary coded decimal numbers, the writing of a computer program to carry out the conversion using that relationship was elementary indeed. It required relatively few steps and could have been written by any skilled programmer. Further, the program could have been written for and utilized by almost any make or model of general purpose digital computer.

B. Patents Issued on Computer Programs Will Extend Patent Protection to Mathematical Techniques, Scientific Principles and Other Abstract Concepts or Rules.

Respondents' discovery is a simple but precise illustration of how and why patents issued on computer programs will have the general effect of extending patent protection to mathematical techniques, scientific principles and other abstract concepts or rules. It therefore presents squarely the question whether this is a desirable, intended, or even permissible result under the patent system.

The computer is an incomparable tool of exploration. So many possibilities and combinations may be explored in such a short time that the truly creative person can exercise his mind more freely than ever before and the

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[14] Brief for Appellants before the Court of Customs and Patent Appeals, at 7-8. This brief has been attached to the Record but is not numbered consecutively with the Record.

less gifted person can, by trial and error, be more innovative than ever before. It is an almost completely flexible tool. The solution to any problem that requires sifting and sorting of information or making of computations and calculations can be described in a computer program. Mathematical and scientific problems are particularly susceptible to solution by use of a computer directed by the necessary computer program.

Many mathematical breakthroughs can be practiced effectively only with the aid of a computer operating in accordance with a computer program, and most of these have no readily available alternatives. Mathematical discoveries of any importance are generally very difficult to "invent around." Nearly any subsequent method designed to achieve the same results would be mathematically equivalent to or obvious from the disclosure made with the initial discovery. Further, the computer is an essential tool to many specialists in mathematics and the sciences. For much of the current work being done in these fields, computation by hand with pencil and paper or mechanical calculators is, as a practical matter, impossible because of the enormous number of calculations to be made and the vast amount of time that would be required with any method other than a computer. If computer programs by which the breakthroughs are achieved could be patented, no one else would be able to make use of the discovery, whether for teaching, research, or commercial application, without permission from the patent owner." Further, most authors of computer programs involving

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[a] For example, respondents' claim 13 is not related to any particular practical use of the mathematics it describes. If issued as a patent it would allow respondents to extract a royalty from anyone using the defined conversion principle for seventeen years. The only practical application which the respondents' patent application discloses is to "program" a computer to make BCD-to-binary conversions in the manner specified. But the patent claim would prevent the use of the mathematical conversion principle in any other apparatus or method and even in hand calculation. Since the

new mathematical techniques would be compelled to make a patent search before running the program on any machine in order to avoid inadvertently incurring infringement liability.

A few examples of significant mathematical discoveries that are inextricably related to computer programming are set out below. These examples demonstrate first, that the major advances or breakthroughs that have been made in programming technology are fundamentally advances in mathematics; second, that a free exchange and wide dissemination of information has long characterized the field; third, that great efforts are now expended to develop relatively minor but helpful and important improvements on discoveries in the field because the benefits of both the discovery and the improvements are available, without limitation, to all who are interested; and fourth, that patents on mathematical techniques that are embodied in computer programs would constitute enormous blocks to progress in the field.

(1) In 1922, Lewis Fry Richardson developed a set of equations that could analyze a given set of atmospheric conditions and predict weather conditions twenty-four hours in advance.[16] The practical difficulty involved in using the Richardson equations was that, at the time, no one could solve the equations within a twenty-four hour period and, hence, there was no way that they could in fact be used to predict weather. Using the digital computer, these equations can be solved in a very short time and thus they can be, and in fact are, used to predict weather.[17]

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principle may be practiced by means of a written representation, it would appear that even the practice of the algorithm in the written directions in a book or article would infringe claim 13.

[16] L. Richardson, Weather Prediction by Numerical Process (Dover ed. 1965).

[17] Charney, Fjortoft, & Von Neumann, *Numerical Integration of the Barotropic Vorticity Equation*, 6 Collected Works of John Von Neumann 413 (A. Taub ed. 1963).

The digital computer is thus a tool which made practical the utilization of this mathematical discovery. However, the basic mathematical advance was made totally independent from, and long before, the development of the computer and is thus clearly independent of the computer.

Similarly, the use of a computer to obtain improved solutions for well known equations is one of the advances in technology which has made the space program possible. The basic equations used to predict orbits for satellites were developed in the 17th century from Newton's Fundamental Laws of Motion. At that time, and for many years thereafter, the solution of these equations was a tedious and time-consuming process that substantially detracted from the utility of the equations.[10] The development of computers capable of solving these equations and computer programs to express the plan for solving the equations in a form acceptable to the computer has not changed the nature of the underlying mathematical principles; nor has it changed the nature of the discovery into patentable subject matter. Such mathematical principles have been and should continue to be unpatentable. In the instant case it is equally evident that the mathematical technique which the respondents seek to patent is likewise independent of the application of this technique to a digital computer and therefore should not be patentable.

(2) In 1947, George Dantzig devised the Simplex Method for solving linear programming problems. This method provides a technique for handling large sets of linear equations. It is clearly and simply a mathematical technique for handling mathematical

[10] F. Moulton, New Methods in Exterior Ballistics (1926).

formulae, however, it has wide and diverse use in industry. For example, it can be used to determine the optimal operating conditions of large complex refineries or to determine the optimal assignment of crew members to aircraft that are flying on a wide array of schedules.[10] The basic discovery was first set out in a mathematical paper published within professional circles[11] and was then programmed for the SEAC computer, one of the first computers ever built. Had patent protection been available on the computer program, one of the most basic mathematical techniques in the use of computers would have fallen into restrictive private custody.

(3) In 1947 Von Neumann and Ulman discovered the Monte Carlo Technique in the course of theoretical work being done on the atomic and hydrogen bombs.[12] Using this technique, they generated large quantities of random numbers which simulated the behavior of sub-atomic particles. These random numbers were then handled according to statistical approximations rather than by rigid mathematical formulae. The Monte Carlo Technique has been widely published,[13] and it has become a standard method

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[10] A. Charnes & W. Cooper, Management Models and Industrial Applications of Linear Programming (1961).

[11] Dantzig, *Maximization of a Linear Function of Variables Subject to Linear Inequalities*, in Activity Analysis of Production and Allocation (T. Koopman ed. 1951).

[12] Richtmyer & Von Neumann, *Statistical Methods in Neutron Diffusion*, 5 Collected Works of John Von Neumann 751 (A. Taub ed. 1963).

[13] *E.g.*, McCracken, *The Monte Carlo Method*, 90 Scientific American 192 (May, 1955); Symposium on Monte Carlo Methods (H. Meyer ed. 1956) (incorporating 19 technical papers); J. Kelson, The Nature of the Monte Carlo Method, Cruft Laboratory Technical Report 127 (1951); Germond, *Summary of the*

for solving certain classes of partial differential equations. The Monte Carlo Technique is essential to the field of mathematical physics and many problems, such as those presented by the design of nuclear reactors, could not have been solved without its use.[53] This basic mathematical technique also has such diverse applications as developing insurance mortality tables and studying the growth of bacteria.[54] Theoretically the Monte Carlo Technique could be practiced using pencil and paper. However, since the number of calculations involved is generally very large, this method can realistically be practiced only with the aid of a computer. Like the Simplex Method discussed above, the Monte Carlo Technique was novel, useful, and expressed in the form of a computer program. Since its discovery no one has found a practical way to mathematically "invent around" it. Each alternative or extension for performing the same type of operations developed since the Monte Carlo Technique is its mathematical equivalent.

(4) In 1963, Fletcher and Powell developed a program for determining certain characteristics of geometrical surfaces. Given a mathematical expression involving several variables, the least and greatest values of the mathematical expression could be found using this method. In many applications, there is no practical alternative to using a computer for this type of work. The program was a significant

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Round Table Discussion at NBSINA Monte Carlo Symposium in NATIONAL BUREAU OF STANDARDS, THE MONTE CARLO METHOD (1951).

[53] *See* Ulman, *Computers*, 211 SCIENTIFIC AMERICAN 202, 205 (September, 1964).

[54] Walsh, *A Monte Carlo Technique for Obtaining Tests and Confidence Intervals for Insurance Mortality Rates* in SYMPOSIUM ON MONTE CARLO METHODS (B. Meyer ed. 1956); Roy, *On the Choice of a Mathematical Model to Represent Normal Bacterial Growth*, 13 STAT. SOC'Y BULL. 41 (1952).

improvement in the field and was immediately published and widely discussed.[16] It has found application in atomic energy research, physics research, and in economic and statistical research. It was the principal method of estimating parameters in certain types of problems for about five years and has spawned many improvements and extensions which have been the subject of intensive discussion at various professional meetings.

(5) In 1964, Bonner discovered a new technique for cluster analysis, improving upon original work done by Tryon in 1939.[17] Using this unquestionably novel and useful computer program, when a large number of items in a mathematical system can not be classified because of great randomness in their characteristics, the items can be divided into clusters; and the items in each cluster will have significant similarities. This technique provided an important mathematical breakthrough for medical work in analysis of patient symptoms. Subsequent improvements have been widely published and are widely used.[17]

(6) It is now evident that the uses of computer programming in advanced mathematics are not limited to working calculations from equations or formulae written by mathematicians. In the new field of symbolic computation, computer programming is used to actually formulate some of the equations needed as well as performing the computations to

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[16] Fletcher & Powell, *A Rapidly Convergent Descent Method for Minimization*, 6 COMPUTER JOURNAL 163 (1963); *see also*, Davidson, *Variable Metric Method for Minimization*, in Argonne National Laboratories publication 5990 (November, 1959).

[17] Bonner, *On Some Clustering Techniques*, 8 IBM JOURNAL OF RESEARCH AND DEVELOPMENT 22 (January, 1964); R. TRYON, CLUSTER ANALYSIS (1939).

[17] See, e.g., Siegel, Goldwyn & Friedman, *Pattern and Process in the Evaluation of Human SepticShock*, 70 SURGERY 232 (August, 1971).

solve the equations. For example, some integration problems in calculus are so extensive that the complications involved in writing the equations are too great for the mathematician to handle. With new breakthroughs in programming, the mathematician will be able to write the broad outlines of the problem and the computer will then both formulate the necessary equations and solve them.[35] These operations are both useful and necessary in the fields of celestial mechanics, relativity theory, physics, biochemistry and economics.

The few examples cited above are among many illustrations of pure mathematical discoveries expressed in computer programs. Any number of such examples could be found by examining the technical publications in this field. What is new and what is the product of inventive genius in each of these cases is the insight into or the mathematical expression of relationships within problems. Once the mathematical relationship is discovered, or as the mathematics are being worked out, any skilled programmer can do the operations necessary to create a computer program. The fact that the computer is a necessary tool with which the discovery is reached or used does not make the discovery any less an innovation in mathematics than did the use of such tools as the abacus, slide rule or adding machine affect the nature of mathematical discoveries in earlier times.

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[35] *See* 9 COMMUNICATIONS OF THE ACM 547 (August, 1966) (contains the proceedings of the ACM Symposium on Symbolic and Algebraic Manipulation, Washington, D.C., March, 1966, at which 24 papers were presented); Sammet, *Formula Manipulation by Computer*, 8 ADVANCES IN COMPUTERS 47 (F. Alt & M. Rubinoff eds. 1967); Sammet, *Software for Non-numerical Mathematics*, in MATHEMATICAL SOFTWARE at 295-330 (J. Rice ed. 1971); 14 COMMUNICATIONS OF THE ACM (August, 1971) (contains a selection of the 55 papers presented at the Second Symposium on Symbolic and Algebraic Manipulation, Los Angeles, California, March, 1971); Moses, *Symbolic Integration: The Stormy Decade*, 14 COMMUNICATIONS OF THE ACM 548 (August, 1971).

The few examples cited above are illustrative of the extensive exchange of information that has, in the past, characterized the mathematics field generally. Significant discoveries are quickly published in professional journals, and symposia are held regularly where contributors present their own work and critique the work of others. These examples also point out that once discoveries are published, there typically occurs a great volume of work dedicated to improvements and extensions of the principal discovery. Many symposia are dedicated almost exclusively to this function. This building and improving has paved the way for further major breakthroughs.

The stifling effect that patent protection would have on this field is evident. If the significant discoveries were patentable and were patented, no use could be made of the mathematical technique without the consent of the patentee. Moreover, the improvements that have characteristically taken place in this free unpatented field would be seriously restricted because other scientists and mathematicians would not be able to use the new idea or technique without a license.

II. COMPUTER PROGRAMS ARE NOT PATENTABLE SUBJECT MATTER.

Subsection A below analyzes the computer program from its origination by the programmer to the point where it is utilized by the machine. Subsection B below analyzes the actual operation of the computer in response to the electrical impulses generated at the direction of the program. Amicus curiae submits it is manifest that in neither respect is a computer program patentable subject matter.

A. A Computer Program Is a Mode of Expression of Ideas and as Such Is Not Patentable Subject Matter.

The language used to describe computers and computer programs is often highly technical and complex. There-

fore it is essential to take a common-sense approach when evaluating computer programs. It is readily apparent that modern computers have enormous potential. They are ready to receive and store millions of units of information, to make hundreds of thousands of comparisons or calculations per second, and to report the results of work done. All of these functions are performed in response to electrical impulses in various combinations. The source of electricity and the physical means of generating the necessary electrical impulses are part of the computer itself. The sequence in which the electrical impulses are generated is directed by the computer program.

A computer programmer changes the mode of expression of ideas or information from a language like English to directions which can be utilized by the computer. The mode of expression that is the computer program encompasses all the work from the conception of the plan or idea through the ones and zeroes on magnetic tape. This work may be done in several steps. A flow chart may be constructed entirely in English but using standard diagramming techniques. This sets out a basic plan. The plan may then be broken down into many detailed instructions set out in a special language such as Fortran [*] that is both a shorthand for and more precise than English. From this point, the remaining translation work is generally done automatically. A keypunch machine changes the written Fortran instructions (typed out by the operator) into punched cards and the computer, operating in response to a compiler program, changes the punched cards into a series of binary representations which can be used directly by the computer. Each of these steps and any combina-

[*] Fortran is a shortened form of Formula Translation. Other programming languages include COBOL (Common Business Oriented Language), ALGOL (Algorithmic Language) and PL/I (Programming Language I).

tion of them is a writing done for the purpose of expressing ideas or information.

Conceding, then, the necessity for programs and the circumstance that their development may require considerable effort, this does not establish that they are patentable subject matter any more than one can derive patentable subject matter from the manuscripts which are the workstuff of printing presses or the photographic subjects without which cameras would be useless. An idea or plan of action translated into computer language is no more patentable than the same idea or plan of action translated or transformed into Chinese poetry. The aura of complex machinery and high-speed electronic wizardry evoked by the descriptions of computer operations does not change the basic nature of the computer program into patentable work product.

This Court has long classified discoveries of a principle, idea, plan, technique or any other abstraction as unpatentable. The purpose of this general classification was to restrict the monopolies granted under the patent statute to the limits intended by Congress and consistent with the Constitutional standard of promoting progress in science and the useful arts. U.S. CONST. art. I, § 8, cl. 8. In *Burr* v. *Duryee*, 68 U.S. (1 Wall.) 531, 570 (1864) the Court plainly stated: "We find here [in the patent act] no authority to grant a patent for a 'principle' or a 'mode of operation,' or an *idea*, or any other abstraction." *See also LeRoy* v. *Tatham*, 55 U.S. (14 How.) 155, 174 (1852); *Fuller* v. *Yentzer*, 94 U.S. (4 Otto) 288 (1877); *Tilghman* v. *Proctor*, 102 U.S. (12 Otto) 707, 724-26 (1880); *Mackay Radio & Telegraph Co.* v. *Radio Corp. of America*, 306 U.S. 86, 94 (1939); *cf. DeForest Radio Co.* v. *General Electric Co.*, 283 U.S. 664 (1931).

More recently, in *Funk Brothers Seed Co.* v. *Kalo Inoculant Co.*, 333 U.S. 127 (1948), this Court reiterated (in the context of a product claim) the basic rule against patenting a principle or law of nature, and

emphasized that in no case can invention be borrowed from the principle or idea *per se*. In *Funk Brothers* the patent holder had used known techniques to experiment with various strains of bacteria that were used in connection with fertilizing crops. He had the idea that several strains of bacteria might be found compatible and therefore could be used together. This would eliminate the need for several independent applications to crops of individual strains of bacteria. The patent holder's experimentation was successful and he was able to package combinations of these bacteria. It was conceded that this product was new, useful, and more efficient than its predecessors. However, the Court held that the discovery was the principle of nature that certain strains of bacteria are compatible. The method of packaging the bacteria was a simple step once it was known that certain strains were indeed compatible.

> ". . . [O]nce nature's secret of the non-inhibitive quality of certain strains of the species of Rhizobium was discovered, the state of the art made the production of a mixed inoculant a simple step. Even though it may have been the product of skill, it certainly was not the product of invention. There is no way in which we could call it such unless we borrowed invention from the discovery of the natural principle itself. That is to say, there is no invention here unless the discovery that certain strains of the several species of these bacteria are non-inhibitive and may thus be safely mixed is invention. But we cannot so hold without allowing a patent to issue on one of the ancient secrets of nature now disclosed. All that remains, therefore, are advantages of the mixed inoculants themselves. They are not enough." 333 U.S. at 132.

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[30] The requirement that invention must reside solely in the practical application of an idea or principle is a complete answer to the argument that "computer logic operations can be performed either with wired circuitry or programming" and that since the wired circuitry is patentable the programs should be also. *See* Brief for

See also Armour Pharmaceutical Co. v. *Richardson-Merrell, Inc.*, 396 F.2d 70 (3d Cir. 1968); *Davison Chemical Corp.* v. *Joliet Chemicals, Inc.*, 179 F.2d 793 (7th Cir. 1950); *cf. Templeton Patents, Ltd.* v. *J. R. Simplot Co.*, 336 F.2d 261 (9th Cir. 1964).

This case is remarkably parallel to the *Funk Brothers* case. What respondents discovered was a principle of mathematics—that the conversion from binary coded decimal to binary could be accomplished by a specified operation of binary addition. Once that was discovered, the method of packaging—the computer program—was a simple step from known programming technology. Since, under the holding of *Funk Brothers*, the discovery of the mathematical principle cannot be a basis for patentability, the basis must arise out of the "packaging" of that principle or patent protection is not available. Clearly, the simple computer program set out by respondents' application is of no greater inventive dignity than the packaging held unpatentable in *Funk Brothers*. Further, amicus curiae contends that the nature of computer programs is such that whatever invention is present will always reside in the principle or idea and that the "packaging" or the mode of expression that makes the computer program machine-readable will be obvious once the principle or idea is disclosed.

B. The Performance of Operations Pursuant to the Instructions Contained in a Program Is the Inherent Function of the Computer and as Such Is Not Patentable Subject Matter.

As described above, the development of a computer program to the point where machine-readable instruc-

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Respondents in Opposition, at 4. This argument overlooks the fact that the underlying mathematical principles cannot lend patentability either to wired circuitry or to a computer program. Wired circuitry may be patentable, but only if invention is found to reside solely in some feature of the wiring.

tions are available and the computer is ready to function is essentially a writing and translation process. But respondents claim that their invention includes more than just the development of the program. It includes the "machine method for converting signals encoded in the binary coded decimal (BCD) notation into signals encoded in the ordinary binary notation." And further ". . . respondents' claims are directed to a particular sequence of machine steps, designed to accomplish a particular result." Brief for Respondents in Opposition, at 1, 3. Respondents claim that the functioning of the computer in carrying out the computer program is itself a patentable process.

However, it is clear that in carrying out the instructions in respondents' program the computer operates entirely as it was designed and intended to operate. Each individual storing, shifting, masking, and adding operation specified by respondents' application is an operation of which the computer is capable entirely apart from any specific instructions. The only contribution of the instructions is to set out a specific sequence of these storing, shifting and other operations to achieve a desired result. Varying the sequence of these operations clearly does not vary the actual nature of the operation in any way from that originally intended by the designer of the computer. There is no suggestion anywhere that claim 8 involves anything other than the most routine application of an elementary computer program to old conventional computers including a "shift register." Indeed, the record is clear that such is the case. Respondents stated to the court below that, "all of the recited signal manipulations are conventional operations which are performed by conventional electronic apparatus." Brief for Appellants before the Court of Customs and Patent Appeals, at 9.

It is well settled that the functioning of a machine, as it was designed and intended to function, is not patent-

able as a process. In the very early case of *Corning* v. *Burden*, 56 U.S. (15 How.) 252 (1853), this Court made this distinction with respect to the definition of a process.

> "It is when the term process is used to represent the means or method of producing a result that it is patentable, and it will include all methods or means which are not effected by mechanism or mechanical combinations. But the term process is often used in a more vague sense, in which it cannot be the subject of a patent. Thus we say that a board is undergoing the process of being planed, grain of being ground, iron of being hammered, or rolled. Here the term is used subjectively or passively as applied to the material operated on, and not to the method or mode of producing that operation, which is by mechanical means, or the use of a machine, as distinguished from a process. In this use of the term it represents the function of a machine, or the effect produced by it on the material subjected to the action of the machine. But it is well settled that a man cannot have a patent for the function or abstract effect of a machine, but only for the machine which produces it." 56 U.S. at 268.

The rule that a function of a machine is unpatentable was reiterated *inter alia* in *Risdon Iron & Locomotive Works* v. *Medart*, 158 U.S. 68, 77 (1895); *Westinghouse* v. *Boyden Power Brake Co.*, 170 U.S. 537, 554-57 (1898); *Expanded Metal Co.* v. *Bradford*, 214 U.S. 366, 383 (1909), and has never been compromised in this Court.[31]

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[31] This reason for rejection of respondents' patent application was raised by the examiner, Record at 18, 29, but was not argued by the Patent Office because this doctrine has been expressly repudiated by the court below. In *Application of Tarczy-Hornoch*, 397 F.2d 856 (C.C.P.A. 1968), it was summarily dismissed as "the product of an essentially illogical distinction unwarranted by, and at odds with, the basic purposes of the patent system and productive of a range of undesirable results from the harshly inequitable to the silly." 397 F.2d at 867.

III. THE PRACTICE IN OTHER COUNTRIES IS TO DENY PATENT PROTECTION FOR COMPUTER PROGRAMS.

The question of the patentability of advances in computer programming has been raised in at least ten other countries, either with respect to specific legislative proposals, or decisions under existing law as to applications for patents on computer programs. The specific provisions of law with respect to patent protection in these countries vary in differing degrees from those in force in the United States. However the basic policy question with respect to the patentability of computer programs is essentially the same within each of these systems of patent law. Each must face the question of the essential nature of a computer program and the effect that patents issued on computer programs would have on the patent system and the public interest. Most countries have resolved the policy problem by refusing to grant patent protection for computer programs.

In France there is a recently enacted direct statutory prohibition on patents for computer programs.[*] The United Kingdom currently has no such direct statutory prohibition, and the applicable law with respect to computer programs apart from hardware is unclear, but the government's Committee to Examine the Patent System

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[*] Article 7 of the French Patent Law provides:

"Any invention is considered industrial which in its object, its application and its result, whether achieved by human intervention or by machine, cooperates in the production of goods or technical results. Not considered as industrial inventions, are, in particular: (1) Theoretical, or purely scientific principles, discoveries or concepts; . . . (3) Financial or accounting methods, rules or games, or all other systems of an abstract character and, in particular, the programs or series of instructions used for promoting the operation of a computer." Patent Law of January 2, 1968, art. 7 (An English translation appears in INDUSTRIAL PROPERTY 67-75 (BIRPI, Geneva, Switz., March, 1968).

and Patent Law last year strongly recommended adoption of a statutory prohibition.[44] The Japanese Patent Office has a regular practice of rejecting patent applications directed to computer programs.[45]

In Australia,[46] Austria,[47] Denmark,[48] The Nether-

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[44] The Committee's report devoted a full chapter to the protection of computer programs and stated:

> "a computer program that is: a set of instructions for controlling the sequence of operations of a data processing system, in whatever form the invention is presented e.g. a method of programming computers, a computer when programmed in a certain way and where the novelty or alleged novelty lies only in the program; should not be patentable." The British Patent System, Report of the Committee to Examine the Patent System and Patent Law, Cmnd. No. 4407, at 144 (July, 1970).

[45] Matsuiye, Protection of Software by Patent Law, Present Status and Argument §2(b), report submitted to Committee for Legal Study of Software Protection, Ministry of International Trade and Industry (July 2, 1971).

[46] Australia: In three cases appealed from rejections by the examiners, the Australian Patent Office has uniformly held program inventions to be not patentable. *N. V. Philips*, 36 Official Journal of Patents, Trademarks and Designs 2392 (1966); *Application of Texas Instruments*, 38 Official Journal of Patents, Trademarks and Designs 2846 (1968); *Application of British Petroleum, Ltd.*, 38 Official Journal of Patents, Trademarks and Designs 1020 (1968).

[47] Austria: The Appeal Senate of the Austrian Patent Office recently held that computer programs are not patentable, B332/70 (A125/67), October 29, 1970, and stated:

> "Protection extending solely to computing rules is not practicable, for . . . scientific rules and principles as such were expressly excluded from patent protection."

See also nullity proceeding against Austrian Patent No. 23,978 owned by the British Petroleum Company, Ltd., 11 Patent Gazette 186 (1968).

[48] Denmark: The Appeal Department of the Danish Patent Office decided a case involving a patent application on a computer program for the first time last year. The Danish Application Department rejected the application on the ground that the invention constituted a programming algorithm and was, therefore, not statutory subject matter. This rejection was affirmed by the Appeal Department. *Application of Telefonaktiebolaget L M Ericsson*, Danish Patent Application No. 1157-69.

lands,[**] and Switzerland,[**] Patent Office appellate proceedings have resulted in decisions declaring that computer programs are *not* patentable subject matter.

Although the question is not settled in Germany, a recent commentary would make it appear that programs are *not* patentable in Germany.[**] The German Patent Office has rejected a patent application on the same invention as is at issue in this case. *Application of Benson*

[**] *Netherlands:* A recent decision of the Patent Office Board of Appeals, on December 16, 1970, held that computer programs are not patentable under the Netherlands Patent Act and stated:

> "The programming of the device according to the invention, the so-called software, is, indeed, founded on a meritorious idea, but the implementation thereof is unpatentable either as a device or as a process." BIE No. 2 (February 15, 1971).

[**] *Switzerland:* Computer programming inventions are currently considered unpatentable in Switzerland as the result of a Swiss Patent Office decision of September 2, 1968 rejecting an application with claims to a computer program. The application related to a procedure for the design of construction reinforcements by programming the calculation for design on a known computer. In reaching its decision the Patent Office stated that the design of a computer program is not an achievement which uses the means of natural forces or which influences natural forces to achieve a "technical result" but rather a purely mental effort for which patent protection is not available. Patent Muster Und Markenblatt 68-1-68.

[**] *Germany:* KRAUSSE, KAUFMANN, & LINDENMAIER, DAS PATENTGESETZ (The Patent Act) at 9 (8th ed. 1970) states:

> "In accordance with the opinion generally advanced in German literature, programs for controlling electrical data processors are not patentable. Such processors operate to a program consisting of a sequence of instructions relating to the actual intellectual achievement. Programs do not solve circuit problems but are dependent upon a particular algorithm. . . . The input of the program, that means its storage, which is effected by means of paper, tapes, punched cards or magnetic tapes, does not alter the fact that the program is merely an instruction for operating the machine, by means of which the stored material is to be checked and processed. It does not constitute, however, a teaching for technical action.

and Tabbot, German Patent Application No. P 1474091.1-53, and an appeal is pending.

The question is also unsettled in Canada. Early in 1971 the Economic Council of Canada, which had studied the patent system and formulated patent policy recommendations, stated: "We conclude, therefore, that patent protection of computer programs would not be appropriate in Canada at the present time." Economic Council of Canada, REPORT ON INTELLECTUAL AND INDUSTRIAL PROPERTY at 103 (January, 1971). The Canadian Patent Office then issued administrative instructions that computer programs were not to be considered patentable subject matter.[a] In December, 1971, however, the Commissioner of Patents decided that "a computer that is programmed in one way is a machine which is different from the same computer programmed another way" and held that some forms of computer programs are patentable. *Application of Waldbaum*, 100 Patent Office Record, p. vii, (No. 3) (January 18, 1972); BNA PATENT TRADEMARK AND COPYRIGHT JOURNAL, p. D-1 (December 23, 1971). In support of his decision the Commissioner cited three cases decided by the United States Court of Customs and Patent Appeals that are in the line of cases preceding and leading to the case at bar. *Application of Prater*, 415 F.2d 1393 (C.C.P.A. 1969); *Application of Bernhart*, 417 F.2d 1395 (C.C.P.A. 1969); *Application of Musgrave*, 431 F.2d 882 (C.C.P.A. 1970). The result in each of these C.C.P.A. decisions is erroneous for the same reasons that the result in the case before this Court is erroneous. The Canadian Commissioner's decision is, therefore, little additional support for the proposition that computer programs are patentable, particularly in light of the opposite position taken by eight other countries.

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[a] The Patent and Trademark Institute of Canada, Newsletter, No. 86 (August 9, 1971).

IV. APPROPRIATE PROTECTION FOR PROPRIETARY INTERESTS IN COMPUTER PROGRAMS IS AVAILABLE THROUGH COPYRIGHT AND ANY NEW FORM OF PROTECTION FOR COMPUTER PROGRAMS SHOULD BE ACCOMPLISHED BY LEGISLATION AND NOT BY JUDICIAL EXPANSION OF THE PRESENT PATENT SYSTEM.

A. Copyright Is an Appropriate Form of Protection for Proprietary Interests in Computer Programs.

Computer programs have been accepted for copyright registration since 1964. The copyright statute, 17 U.S.C. § 1 *et seq.*, makes no reference to computer programs, but the Copyright Office has decided that computer programs are covered by the general provisions of the statute because they are readable, they have authors, and they are writings.[a]

Computer programming is a very flexible art. Given a single problem and a basic plan for its solution, two different programmers could, and likely would, write two different computer programs to put the instructions for the solution into a form acceptable to a computer. The principal merit of copyright protection is that it would protect only against the copying of the expression of the idea, that is the computer program as worked out by the programmer. It would not extend to the "idea" behind the program; that is the algorithm or basic plan for the solution of the problem.[a]

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[a] Copyright Office, *Announcement*, 11 BULL. COPYRIGHT SOC'Y 261 (1964); *see also* Nelson, *The Copyrightability of Computer Programs*, 7 ARIZ. L. REV. 204 (1966); *Note, Copyright Protection for Computer Programs*, 64 COLUM. L. REV. 1274 (1964).

[a] As this Court held in *Baker* v. *Selden*, 101 U.S. (11 Otto) 99, 103 (1880):

"The copyright of a work on mathematical science cannot give to the author an exclusive right to the methods of opera-

The creation of complex and sophisticated computer programs typically costs many thousands of dollars.[44] Most, perhaps as much as 90%, of this cost is incurred in the very time-consuming job of transforming the basic plan or set of steps for solution of the problem (the algorithm or the "idea") into a finished product in programming or machine language. Therefore the need for protection against copying is very real. Copyright achieves the basic purpose of preventing one who has made no investment of time or money in creating a computer program from appropriating the program by copying it. However, it does not prevent the legitimate creator of computer programs from independently arriving at the same overall result by making his own investment of the required time and effort. Thus the owner's efforts are secured without the accompanying effect of stifling further development of the idea or of the field.

B. New Forms of Protection for Computer Programs Are Being Formulated and Considered by Congress.

Amicus curiae does not contend that the proprietary interests in computer programs should be without protection beyond copyright.[45] Indeed, in the long run,

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tion which he propounds, or to the diagrams which he employs to explain them, so as to prevent an engineer from using them whenever occasion requires. The very object of publishing a book on science or the useful arts is to communicate to the world the useful knowledge it contains."

See also M. NIMMER, COPYRIGHT § 37.2 (1971); *accord*, *Mazer* v. *Stein*, 347 U.S. 201, 217 (1954).

[44] One example cited is that a program that cost $250,000 to produce could be copied for as little as $50. Reynolds, *Software Protection and Software Sale*, 9 DATA PROCESSING MAGAZINE 50 (May, 1967).

[45] Trade secret protection is already available for those who desire to restrict knowledge of the computer program to a selected

the maintenance of the necessary incentives to development of new program ideas may well require some limited form of protection against unauthorized copying or use that goes beyond present copyright law. Amicus curiae does contend, however, that the current patent statute is an inappropriate means of protection, which cannot and should not be extended by judicial decision to meet this need.

It is significant that general revision of the patent laws has been under active consideration by the Congress since the report of the President's Commission on the Patent System was issued in 1966[46] and the question of the patentability of computer programs has been reviewed in this context. Moreover, several proposals have been made for legislation to create a special and limited form of protection, somewhere between copyright and patent, tailored to the computer programming industry and its dependence on ready access to new pro-

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few. However, trade secret protection would not extend to a program that was widely sold or circulated. *See generally* R. MILGRIM, TRADE SECRETS § 2.09[5] (1972).

[46] Nine bills were introduced during the 90th Congress: S. 1042, 90th Cong., 1st Sess. (1967); S. 1691, 90th Cong. 1st Sess. (1967); S. 2164, 90th Cong., 1st Sess. (1967); S. 2597, 90th Cong., 1st Sess. (1967); S. 3892, 90th Cong., 2d Sess. (1968); H.R. 5924, 90th Cong., 1st Sess. (1967); H.R. 7454, 90th Cong., 1st Sess. (1967); H.R. 10006, 90th Cong., 1st Sess. (1967); H.R. 11447, 90th Cong., 1st Sess. (1967).

Four bills were introduced during the 91st Congress: S. 1246, 91st Cong., 1st Sess. (1969); S. 1469, 91st Cong., 1st Sess. (1969); S. 2756, 91st Cong., 2d Sess. (1970); H.R. 12280, 91st Cong., 1st Sess. (1969).

Two of the bills introduced in the 90th and 91st Congresses were reintroduced in the 92d Congress. S. 643, 92d Cong., 1st Sess. (1971); H.R. 4012, 92d Cong., 1st Sess. (1971). Hearings were held on S. 643 on May 11, 1971. CCH Congressional Index, 92d Congress, p. 2506 (1972).

gram concepts."[47] Whatever additional forms of protection are to be extended to computer programs should be decided by Congress, after full consideration of the impact that such protection would have on this new and flourishing field.

[47] *See generally*, Morris, *Protecting Proprietary Rights of Computer Programs: The Need for New Legislative Protection*, 21 CATH. U. L. REV. 181 (1971); Goldberg, *Legal Protection of EDP Software*, 18 DATAMATION 66 (May, 1972); R. Brown, Property Rights Under the New Technology, Hopkins-Brookings Lecture Series, The Brookings Institution, Washington, D.C. (February 12, 1970); Galbi, *Proposal for New Legislation to Protect Computer Programming*, 17 BULL COPYRIGHT SOC'Y 280 (April, 1970) (IBM proposal); Comment, *Computer Program Protection: The Need To Legislate a Solution*, 54 CORNELL L. REV. 586 (1969).

CONCLUSION

The decision of the Court of Customs and Patent Appeals should be reversed.

Respectfully submitted,

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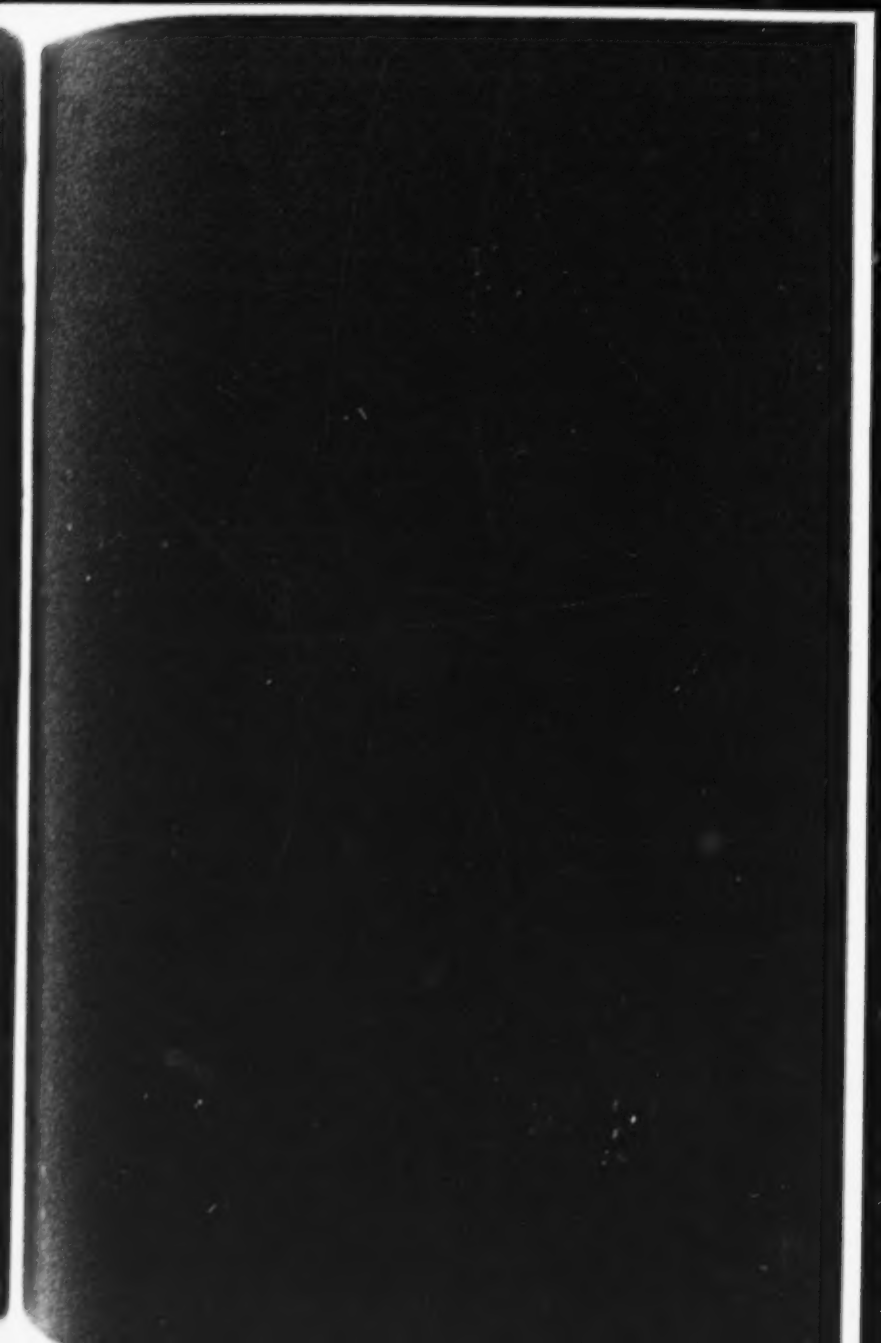

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IN THE

Supreme Court of the United States

OCTOBER TERM 1971

No. 71-485

ROBERT GOTTSCHALK, Acting Commissioner of Patents, *Petitioner*,

v.

GARY R. BENSON and ARTHUR C. TABBOT, *Respondents*.

On Writ of Certiorari to the United States Court of Customs and Patent Appeals

BRIEF AMICUS CURIAE ON BEHALF OF THE BUSINESS EQUIPMENT MANUFACTURERS ASSOCIATION

I.

INTEREST OF AMICUS CURIAE

This brief *amicus curiae* is submitted by the Business Equipment Manufacturers Association ("BEMA") in accordance with Rule 42(2) of this Court. Both the petitioner and the respondents have consented to the filing of this brief.[1]

BEMA is the trade association which has represented the business equipment industry for the past 56 years.

[1] The letters from counsel for the parties giving their consent to the filing of this brief are on file with the Clerk of this Court.

The sixty-five (65) companies comprising the current BEMA membership include the nation's leading manufacturers of computers and computer-related equipment. While product lines of member companies vary widely, the following list is illustrative: electronic computers, computer software, including programs, computer input and output devices, computer storage devices, support services, data transmission equipment, optical and magnetic character readers, addressing machines, adding, calculating, accounting and bookkeeping machines, office copying machines, typewriters, dictating equipment, and office furniture. The extent to which much of this equipment can be utilized effectively depends in great measure on the applications and systems programs developed by computer programmers to control the operations of this equipment.[1]

One of BEMA's three semi-autonomous product groups—the Data Processing Group ("DPG")—is especially concerned with the issues presented in this case.[2] The members of DPG have consistently been

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[1] BEMA is also the approved sponsor under the American National Standards Institute (formerly the United States of America Standards Institute and also formerly the American Standards Association) for the establishment of domestic and international standards related to information processing, computers and office machines.

[2] The following members of BEMA's Data Processing Group join in this brief: Addressograph Multigraph Corporation, Burroughs Corporation, Computer Machinery Corporation, Data Products Corporation, Digitronics Corporation, Honeywell, Inc., IBM Corporation, Moore Business Forms, Inc., Mosler, The National Cash Register Company, Olivetti Corporation of America, Pitney-Bowes, Inc., The Singer Company, The Standard Register Company, Sperry Rand Corporation, TRW Data Systems, Inc., Tally Corporation, UARCO, Inc., Wang Laboratories, Inc., Xerox Corporation.

fore-runners in achieving major developments, in both the concept and application, of data processing, and have contributed greatly to the present significant role of the computer in modern society. As a result of the need for continuing advancement in computer programming, these members maintain extensive programs devoted to applied research and systems development, as well as in all other phases of computer use and data and information processing.

Neither BEMA nor any of its member companies has any direct interest in the Benson and Tabbot patent application itself, or in the enforcement of any patent issued thereon.[4] However, the subject matter of that patent claim—computer programs—is of vital concern to the data processing industry. As *amicus curiae* herein BEMA has a deep interest in the proper resolution of the legal questions raised in this case and the profound impact this decision will have upon the data processing industry and the public it serves.

In this brief, BEMA will attempt to outline the inevitable difficulties and uncertainties in the future development and use of computer programs which will follow if the lower court's decision is affirmed, as well as the social, economic and practical implications of any holding that computer programs are patentable subject matter. When the issue presented in this case is considered fully, it is apparent that the lower court's decision misconstrues the constitutional and statutory

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[4] It is conceivable that, if this patent is issued, Bell Telephone Laboratories will allege that some or all of the BEMA members require a license. However, the submission of this brief was motivated by concern relative to the overall issue of whether programs are patentable rather than by any concern about the specific patent involved.

mandates concerning patentable subject matter and that its affirmance could inhibit future developments in this field which affects virtually all aspects of our society.

II.

THE NATURE OF COMPUTER PROGRAMS

Although the subject of electronic data processing is complex by its very nature, it is nonetheless possible to discuss computers and computer programs in relatively simple terms. A computer is essentially a machine which in acting upon information (i.e., instructions and data), performs a finite or determinable number of distinct operations on that information (data) and produces an answer or result. In effect, the computer enhances and extends man's problem solving capacity by providing more powerful methods for calculating, storing, organizing, structuring, retrieving and manipulating large amounts of information in the form of data.

The makeup of a general purpose computer may be described in the following manner. The machine has input and output units which accept and deliver formatted information; a memory or storage unit which holds or keeps data in addressable locations; a calculating or computing unit which performs various arithmetic and logical operations upon the data; and a control unit which controls the operations and coordinates the activities of the other units. The data or instructions are manifested in these various units by electrical pulses or states. Each of these units has various devices for manipulating or handling the electronic pulses and basically all function in accordance with the so-called binary mode (*i.e.*, each element can have its state elec-

trically altered from 0 to 1, from positive to negative or from more than to less than).[5]

The electronic digital computer was first used commercially in the mid 1950's.[6] The revolutionary nature of this instrument resulted from the ability to use electronics and electromagnetic impulses to simulate problems and to manipulate, handle and store data and and information needed to solve problems in ways never before considered feasible. In the intervening twenty years, the capabilities of computers have advanced remarkably, and it is now possible for one machine to service—virtually at the same time—many users with unrelated and diverse needs. The advance in the state of this art in the last two decades is evidenced by a comparison of the fundamental addition function of one of the most advanced electro-mechanical machines ever built: the Mark I, and present day computers. The Mark I could perform one twenty-three digit addition in three-tenths of a second, whereas present day machines can perform five million such additions in the same time period.[7]

Although a computer is capable of handling a large variety of problems, the number of basic operations it can perform (adding, subtracting, multiplying, dividing, comparing, shifting, storing and the like) is limited. Every computer can operate solely in accordance

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[5] For a general discussion of how a computer operates, *See*, Protecting Proprietary Rights of Computer Programs: The Need For New Legislative Protection, 21 The Catholic University Law Review 181, (Fall, 1971).

[6] The first commercial sale of a computer took place in 1954 when Univac I was sold to a private company.

[7] Computers, Office Machines and The New Information Technology (MacMillan, 1969).

with the directions it is given. These directions are contained in the computer program and tell the computer how it should manipulate and compare data in accordance with the algorithm or logical or mathematical formula upon which the program is based.[8]

It is important to emphasize that regardless of the complexity of a computer program it is nothing more than a set of instructions to a computer as to how it should manipulate information and data. The computer program may direct something as simple as adding two plus two, or as complex as determining the proper course for a manned flight to the moon (a series of arithmetic calculations). In solving such problems, the computer can only function in accordance with the algorithm used by the programmer for solving the problem.

Computer programs are often described as either systems or applications programs. Systems programs (executive routines) are normally developed by the computer manufacturer, and are designed as an integral part of the computer system functioning in a housekeeping or control capacity for the many specific types of jobs to be performed. Applications programs, in effect, make a general purpose computer system function as a special purpose system for a limited time and purpose, and a large number of these programs are developed by the various computer users. Frequently, there is disagreement as to whether a given

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[8] An algorithm is a logical series of steps which proceeds from a beginning point to some conclusion and takes account of all the logical possibilities that can occur between these points. The respondents in this case adopted a similar definition in their application to the Patent Office which stated: "By 'algorithm' is meant a self-consistent set of ordered steps specifying definable operations and leading to a desired result." (R. 34).

program is an applications or systems program; however, this brief refers in greater degree to applications programs.[9]

In whatever form it is ultimately utilized, a computer program is created in essentially the same way in which one writes a book or musical score. A senior programmer or systems analyst, who is frequently a highly skilled mathematician, will first set forth in broad terms the desired mathematical principles or logical sequences or methods to be used in solving the problem. In the computer field, this process is known as developing an algorithm. This algorithm is normally expressed by means of a so-called flow chart or decision table. The next step in the process is often handled by a second person, sometimes called a "coder", who need not be as highly skilled, and who develops a detailed set of instructions or code which will tell the computer how to implement the algorithm set forth on the flow chart. In devising the algorithm and in preparing the flow chart and code or set of instructions, the programmers need know little or nothing of the computer's workings or how it actually handles and manipulates the information received.

Given a particular algorithm, the programmer (i.e., coder) takes the limited number of fixed operations which a computer is capable of carrying out and arranges these operations in a sequence so that the desired algorithm is implemented. The result is what is termed a program. In other words, the program determines how the computer will implement the steps

[9] This brief is not directed toward computing systems expressed as configurations of hardware circuitry which if properly disclosed and claimed may constitute patentable subject matter.

or procedures incorporated in the algorithm being used to solve the given problem.[10]

An appropriate analogy is often considered to be found in the way in which a player piano operates. The piano has a mechanism for automatically operating its keys according to the instructions or code contained in a punched paper tape or paper piano roll. A given musical composition can be automatically played on the piano by simply punching holes in the piano roll in such a manner that the keys will play the musical notes called for by the composition. In fact, the piano and its control mechanism are designed in such a way that it is able to perform any musical composition whose notes are recorded in the tape or piano roll.

The algorithm or mathematical principle upon which a computer program is based is the equivalent of the musical composition in the player piano analogy, and the series of machine instructions used to implement the algorithm in a computer program, are analogous to the punched paper piano roll. In both instances, the second step amounts to nothing more than a set of instructions for the machine (*i.e.*, computer or piano) automatically to implement the mental processes or steps contained in the algorithm or musical composition. Such creativity as exists lies solely in the development of the algorithm or musical composition, and any patent issuing thereon would necessarily be grounded on the ideas or mental steps involved.

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[10] See, discussion of basic elements of computer programming in Breyer, The Uneasy Case for Copyright: A Study of Copyright in Books, Photocopies, and Computer Programs, 84 Harv. L. Rev. 281, 340-51 (1970).

III.

ARGUMENT

A. POLICY CONSIDERATIONS OPPOSED TO THE AVAILABILITY OF PATENTS FOR COMPUTER PROGRAMS

(1) Continued Economic Growth In the Computer Industry And Full Utilization Of Computers May Be Substantially Impeded By Granting Patents On Computer Programs

In less than two decades the computer industry has become a major and substantial factor in our economy and now impacts virtually all segments of society. When computers were first used commercially less than twenty years ago, a number of respected businessmen, scientists and public officials believed that the ultimate need for such highly sophisticated devices would be limited to a few dozen systems. In fact, the uses and applications of computers have increased beyond the most extravagant earlier projections, and by 1972 over 165,000 computer systems made by American-based companies are reported to be in use, with a cumulative value of $49.8 billion.[11] This rapid growth will continue over the next few years and it has been estimated reliably that by 1976 there will be over 357,000 American-made computer systems in use with a value in excess of $87 billion.[12]

In the so-called programming and software side of the industry, computer users are already spending as much on software as they are on computer hardware,

[11] EDP Industry Report, March 30, 1972, Vol. 7, No. 10 at p. 4. These figures are for worldwide use of computers made by American companies. In the United States alone, the cumulative value of computer systems in use in 1972 is estimated at $30.3 billion and by 1976 this figure is projected at $50.4 billion.

[12] *Id.* at p. 4. This report also states on page 1 that in 1971 total worldwide revenues for American-based companies from computers and related activities was $12.5 billion and that by 1976 total revenue will be $27 billion.

and the software field has itself become a multi-billion dollar sub-industry.[13] The growth rate of the software field is expected to increase significantly and in less than five years computer users will be spending at least twice as much on software as on computer hardware.[14] For example, it has also been estimated reliably that the gross value of software purchased and supplied in the United States in 1970 was approximately $5 billion, that by 1975 this figure should double to $10 billion, and that by 1980, it will triple to $15 billion.[15]

The tremendous growth of the computer software industry and the vast number of breakthroughs in the field of programming, which have occurred in the last two decades, have taken place in a legal framework conducive to the free interchange of ideas and information. Industry experience shows that new algorithms and programming techniques, as well as specific programs, have been widely disseminated and generally exchanged. Users of computers have been able to draw freely from large libraries of programs and algorithms developed by other users, and computer manufacturers.

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[13] To select an arbitrary point in time to illustrate the growth factor, in 1957 the Association For Computing Machinery had approximately 3,000 members which represented the vast majority of the working computer programmers in the United States. Some fifteen years later in 1972, it has been estimated that the number of employed programmers exceeds 250,000, and by 1975 it has been conservatively estimated that there will be in excess of 500,000 working programmers. *See, Expanding Use of Computers, In The 70's, Markets • Needs • Technology*, p. 51 (Prentice Hall, 1971); Carlson Testifies on Programmer—Professional or Not, 14 Communications of the ACM 201 (March, 1971).

[14] "Towards the Computer Utility: Evolution or Revolution," *Datamation*, October, 1969, p. 125.

[15] *See, Expanding Use of Computers In The 70's, Markets • Needs • Technology*, pp. 54-55 (Prentice Hall, 1971).

This atmosphere of intellectual freedom has contributed significantly to the enormous strides made in the use of computers. The Department of Justice found during its examination of the computer programming field that:

> Growth in the software portion of the computer industry has been facilitated by a remarkably free and easy exchange of ideas, concepts, and programs. One of the notable features of the programming industry, indeed, has been the widespread establishment, sponsorship, and universal acceptance of joint user groups to facilitate the exchange of programs and algorithms. As a result, for the past twenty years, *almost all basic ideas in computer programming have been available openly to all computer users.* (Emphasis added).[16]

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[16] Letter dated October 21, 1966, from Donald F. Turner, Assistant Attorney General, Antitrust Division, to Edward J. Brenner, Commissioner of Patents. This letter further states that as a matter of public policy patents should not be granted:

> One of the major policy arguments advanced for extension of patent protection to computer programs is a supposed need to encourage individuals and companies to invest in programming development. But it is difficult to conceive how the field of programming could have grown faster, or that its past growth has been hampered in any meaningful fashion by a lack of investment funds. If anything, the current free interchange of programs has led to an extraordinarily efficient use of scarce programming talent and has kept needless duplication of existing programs and techniques to a minimum. Furthermore, many small software companies have achieved financial and technical success by producing more efficient versions of widely used manufacturer-developed programs. These more efficient versions of operating programs benefit other software producers, computer manufacturers, computer users, and the general public. In the light of past experience, any step which could upset the vital interchange of programming material should be approached with the utmost caution.

This atmosphere of freedom has benefitted not only the computer manufacturers, but also the users and the public at large. For years professional journals published algorithms and pertinent discoveries in mathematics in order to encourage overall advancement of the "state of the art" of programming. At various seminars and symposia on computer programming, open, frank and public discussions have been held concerning newly discovered algorithms or refinements of existing algorithms, and the participants have sought to build upon and improve the overall level of knowledge in the programming field. However, with the advent of patent protection for computer programs, as well as increased investment in software by users and software companies, more restrictive information handling practices are already in evidence, and certain professional journals have now taken the position that they will no longer publish allegedly novel algorithms if the person who develops them claims patent protection.[17]

Similarly, BEMA is informed that many computer users are reluctant to discuss new algorithms and are tending to shroud their computer programming operations in greater secrecy. This course of action is being followed in certain instances in order to protect a new algorithm or mathematical discovery pending the preparation and filing of a patent application, and in other instances, in order to avoid imagined or real infringement claims by holders of existing computer

[17] The Association of Computer Machinery ("ACM") has taken this position with respect to its monthly publication known as the *Communications of the ACM*. The membership of this association includes many professional computer programmers who rely upon and look to such professional journals for maintaining and improving their general knowledge concerning developments in the programming field.

program patents. In this regard, because most programs developed by these users are available to a limited number of employees and can be stored in machine readable form so as not to be perceptible to the human eye, it is difficult, if not impossible, to determine whether a given user is or is not infringing.

Another significant consideration is that the programming industry is quite different from other industries in which patent laws have wide application. One of its unique characteristics is that almost all of the end users of programs are also creators and duplicators of programs.[18] Although there are thousands of computer systems in this country, these systems service millions of users. Many of these user organizations have large staffs of programmers who spend full time preparing new algorithms or sets of instructions for programs, and these same users characteristically spend more internally for computer services than they pay externally for use of the computer.

Under the lower court's decision in this case, substantial practical impediments will now be imposed upon all users of computers. These users will be forced to assume a major responsibility for determining potential infringement claims arising out of computer applications programs they intend to use. They will be burdened with the need either to spend substantial time and money in right-to-use searches each time a different algorithm is to be programmed on an existing computer, or to employ secret methods of handling computer programming information in order to prevent others from ascertaining that they may have in-

[18] It is the user of a computer who often devises the application programs, i.e., the programs which adapt the computer and a general systems program to his specific uses.

fringed an existing patent. Adversely held patents based upon computer programs will be a constant threat to the unrestricted use of computers.

Unlike a copyright, a patent may be infringed without knowledge of the patent or intent to infringe. This means that each user of a computer would, if applications programs were patentable, proceed at his peril in employing the computer for his particular problem, never knowing whether the algorithms in his program were specifically covered by an existing patent or were the equivalent of a claim in a patented program. Such users could be confronted with the real possibility that use of a particular algorithm would involve them in nuisance infringement litigation unless they were to pay royalties claimed by holders of patents covering allegedly comparable programs. It is not a practical answer to say that each user could make a search to determine whether his proposed program infringed an existing patent. Many users of computers are relatively small entities, which do not have the capacity or finances to make such searches, even assuming "use" searches were feasible.[19]

Furthermore, since computers will be more widely used on a time-sharing basis in the future, the existence of patent monopolies on computer applications programs may seriously impede effective development and utilization of such multi-user systems. Often the proprietor of the computer in such systems does not know what programs the user is employing, and the user will frequently neither be fully acquainted with nor even

[19] There is not now—and there does not appear to be in the future—any feasible way in which such searches could be made. Nor can the burden be assumed by, or shifted to, suppliers of computers who do not have responsibility for, or often even knowledge of, the precise programs employed by users of their computers.

concerned with the details, structure or makeup of the computer. It will be substantially impossible for either of them to make an adequate right-to-use search and thus determine whether existing computer applications program patents might be infringed.

The patent claims in the instant case represent an excellent example of how the granting of a patent on a computer program could impede future development and use of computers and computer programs. For many computer operations, it is necessary to convert data from the binary coded decimal system to the true binary system, and purportedly, the respondents have discovered a new method for making this arithmetic conversion. This discovery was developed for Bell Telephone Laboratories, the assignee of the patent claim of the respondents (and their employer) for use in the telephone switching systems of American Telephone and Telegraph Co. ("AT&T").

It is widely known that AT&T's subsidiary, Bell Laboratories, has a large and highly sophisticated research and development activity and that Bell often claims arguably novel discoveries in computer programming.[20] Although these discoveries are made in connection with research for AT&T's telephone communications business, the concepts involved can have

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[20] In American Telephone and Telegraph Co.'s ("AT&T") 1971 Annual Report, at p. 14 it is stated that AT&T's expenditures for research and development in 1971 amounted to $480 million, most of it for Bell Laboratories' activities. In discussing Bell's research activities in the computer field, the annual report states: "Increasingly, the laboratories [sic] is applying its talents to the analysis of complex operating problems . . . and to the development of computer-based programs to facilitate economic management of telephone company resources."

broad application in the programming field.[21] Yet if Bell Laboratories is given a valid and enforceable patent on this discovery, all users of such computer programs, no matter what their field of application, could be liable for royalty payments to Bell for use of the algorithm involved. We submit that such a result was clearly never intended by Congress when it added the term "process" to the Patent Code in 1952, nor could it have been, without doing violence to the statute's Constitutional infrastructure," . . . to promote the progress of science and useful arts. . . ." Article I, Section 8, Clause 8.

(2) The Future Potential Of Computers To Serve Society Will Be Adversely Impacted As A Consequence Of The Lower Court's Holding

Increased computer utilization will contribute to a substantial upgrading of the quality of life for every American. In a few years, the computer will become the "engine" which assists in running our society[22] and will be able to assist man in numerous areas totally unrelated to the usual business applications for com-

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[21] The respondents acknowledged in their application that they claim a patent on the algorithm involved and not just its use in a telephone switching system:

> 'To avoid further difficulties, it is here expressly admitted that applicants' method claims are directed to a machine algorithm for converting binary-coded-decimal representations into binary representations. By 'algorithm' is meant a self-consistent set of ordered steps specifying definable operations and leading to a desired result. The program described symbolically on page 7 is just one way of implementing this algorithm.' (R. 34).

[22] Binger, "The Computer: Engine of the Eighties", *Advanced Management Journal*, January, 1967.

puters today.[23] Some typical examples of computer uses and applications which can occur in the next few years include the following:

Health Care

Computers will soon monitor instruments and sensors in intensive care units and give an instantaneous current diagnosis of the condition of each patient in a hospital. Computers will also record and analyze laboratory tests and will maintain accurate medical records on all patients. They will serve as communication and information links among various hospitals and individual doctor's offices and clinics, and will provide current information on all developments in the medical field. It is also predicted that as a result of the use of sophisticated computers in medical research, a cure for cancer may be found.[24]

Education

Computer-aided training and instruction will become commonplace, and for the first time high quality education will be available to all children on an equal basis, including those in ghettoes and remote rural areas. Computers will be heavily responsible for

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[23] Among the many articles discussing the revolutionary impact computers will have on our society are the following: Bjerrum, "Forecast of Computer Developments and Applications 1968-2000," *Futures*, June, 1969; Martino, "What Computers May Do Tomorrow," *The Futurist*, October, 1969; Hammer, "Electronic Systems of Today and Tomorrow," Paper for State Department Seminar, June, 1969; "What Comes Next in The Computer Age," *U.S. News & World Report*, June, 1967; Diebold, "The New World Coming," *Saturday Review*, July 23, 1966; Ware, "Future Computer Technology And Its Impact," The Rand Corporation, March, 1966.

[24] McCarn and Moriarty, "Computers In Medicine," *Hospitals, J.A.H.A.*, January 1, 1971; "The Computer In Medicine," *Am. News*, March 2, 1970; Reilly, "Computers In Medicine," *Datamation*, May, 1969.

making practical that everyone, regardless of economic status, have the advantages of higher learning. In addition, virtually all of the world's recorded knowledge can be tied together and retrieved, so as to be available for instantaneous use wherever a computer terminal is located.[35]

Science

Computers will make possible further advances in science, such as exploration of other solar systems and interplanetary travel. Scientists will be able to converse with computers and have available large libraries of data on an instantaneous basis. This will make possible a push back in the frontiers of mathematics, chemistry, physics and engineering to an extent difficult to comprehend by present standards.

Government

Computers will also present unique opportunities for government to be more effective and helpful to the average citizen. With the aid of new technological developments in computer programming, a given problem such as pollution control or urban planning, can be simulated in terms of a mathematical model. This model can then be entered into the computer and the data manipulated to stimulate actual results from the application of a proposed solution.

There are also tremendous potentials for computers to assist in relieving the nation's crowded court dockets, to collect and analyze legal documents and precedents, and to achieve better overall administration of the rapidly increasing workload of the police and law enforcement agencies.

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[35] *See,* Computers in Higher Education, Report of the President's Science Advisory Committee, February, 1967; Hansen, "Computers in Education," *The Clearing House,* December, 1970, Vol. 45, No. 4, p. 195.

In the case of judges and lawyers, computers will soon be able to furnish virtually instantaneous print-outs and summaries of all relevant cases and other precedents, and will also furnish invaluable assistance in collecting, summarizing and cataloging much of the factual data involved in complex litigation and other areas of the law.

Individual

It is reasonable to expect that computers will present unique opportunities for the average individual in his everyday activities. Computer-directed systems can now control entire production operations and even whole refineries, chemical plants, steel mills or other continuous manufacturing processes. Man is thereby freed from routine tasks and is able to apply himself to more productive and fulfilling work.

In the home, computers will assist in performing such functions as food procurement, climate and lighting control. Also, computers will make it possible for individuals to obtain information needed on any subject, through point-to-point communication with a central computer. In a few years computer terminals or communication devices will be just as common in homes as telephones or television sets.

To a substantial degree, whether the future potential of computers will be fully realized depends on the legal framework within which the industry is developed. If the lower court's decision is upheld, future growth in this field may well be impeded to the ultimate disadvantage of the public. As indicated hereafter, such a result was never intended under the Patent Clause of the Constitution, Article I, Section 8, Clause 8, nor the Patent Statute, Title 35 U.S.C.A.

B. THE NATURE OF COMPUTER PROGRAMS AS MENTAL STEPS RENDER THEM INELIGIBLE FOR PATENT PROTECTION UNDER THE CONSTITUTION AND THE PATENT CODE

The lower court in this case has held that a computer program may be a "patentable process" under the applicable sections of the Patent Code, Title 35, U.S.C.[36] This holding is clearly in conflict with the weight of judicial authority, as well as the considered view of the Patent Office and the President's Commission which conducted a detailed study of the patent system.[37]

As discussed previously in this brief, a computer program is essentially a plan of action or set of operating instructions for a computer, and encompasses an algorithm or mathematical formula which is an abstract idea or principle. The significance of the instant case is that it makes possible the patenting of a claim covering a method or algorithm for solving problems, regardless of the nature of the apparatus used for implementation. In the lower court's view, the method utilized to implement the claim is irrelevant and, in fact, the court observed that the claim involved here could theoretically be implemented by any kind of recording medium, including "pencil and paper" or even "red and blue poker chips and a surface to put them on or slots to put them in so that 0's and 1's can be represented."[38] The effect, therefore, of the instant decision is to provide patent protection to abstract

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[36] The lower court's decision is reported at 441 F.2d 682. The relevant statutory provisions are contained in Sections 100(b), 101 and 102 of the Patent Code, Title 35, U.S.C.

[37] *See*, "To Promote The Progress Of Useful Arts," The 1966 Report of the President's Commission on the Patent System (reprinted in S. Doc. No. 5, 90th Cong., 1st Sess., p. 21).

[38] *See*, 441 F.2d at 688.

ideas and principles. Such a result is inconsistent with the prior holdings of this Court.

The relevant clause in the Constitution which governs the granting of patents is contained in Article I, Section 8, Clause 8 which provides:

> The Congress shall have power . . . to promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries.

The focus of the patent clause (and the statutes implementing that clause) is on "progress," and Congress is granted only a "qualified authority . . . limited to the promotion of advances in [science and] the useful arts." *Graham* v. *John Deere Co.*, 383 U.S. 1, 5 (1966). Because "[t]he patent system must promote . . . progress," *Graham, supra*, "[p]atents cannot be sustained when . . . their effect is to subtract from former resources freely available to skilled artisans," *Great A & P Tea Co.* v. *Supermarket Equipment Corp.* 340 U.S. 147, 152 (1950).[*]

Among such resources are the scientific principles, mental processes and abstract intellectual concepts which are the basic instruments of scientific and tech-

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[*] As this Court declared in *Precision Instrument Mfg. Co.* v. *Automotive Maintenance Mach. Co.*, 324 U.S. 806, 816 (1945):

> A patent by its very nature is affected with a public interest. As recognized by the Constitution, it is a special privilege designed to serve the public purpose of promoting the 'Progress of Science and useful Arts.' At the same time, a patent is an exception to the general rule against monopolies and to the right to access to a free and open market. The far reaching social and economic consequences of a patent, therefore, give the public a paramount interest in seeing that patent monopolies . . . are kept within their legitimate scope.

nological development. The free interchange of such information cannot be restricted by patent monopolies. As Chief Judge Garret observed in *In re Abrams*, 188 F.2d 165, 168 (C.C.P.A., 1951):

> Citation of authority in support of the principle that claims to mental concepts which constitute the very substance of an alleged invention are not patentable is unnecessary. It is self-evident that thought is not patentable.

Also, see the passages from the letters of Thomas Jefferson, the first administrator of our patent system, quoted in *Graham* v. *John Deere Co.*, *supra*, at p. 8, n. 2.

As early as 1877, this Court perceived the serious problem of extending patent monopolies to ideas and in the landmark decision of *Cochrane* v. *Deener*, 94 U.S. 780 (1876) observed that basic scientific thoughts and abstract ideas cannot be patentable as a "process." That case set forth what has been considered for the last ninety-five years as the definition of a patentable process:

> . . . A process is a mode of treatment of certain materials to produce a given result. It is an act, or a series of acts, performed upon the subject-matter to be transformed and reduced to a different state or thing. If new and useful, it is just as patentable as is a piece of machinery. In the language of the patent law, it is an art. The machinery pointed out as suitable to perform the process may or may not be new or patentable; whilst the process itself may be altogether new, and produce an entirely new result. The process requires that certain things should be done with certain substances, and in a certain order; but the tools to be used in doing this may be of secondary consequence. (94 U.S. at 788)

This often quoted principle has become settled law. See *e.g.*, *Corning* v. *Burden*, 56 U.S. 252 (1853); *O'Reilly* v. *Morse*, 56 U.S. 62 (1853); *New Process Fermentation Co.* v. *Maus*, 122 U.S. 413 (1887); *Expanded Metal Co.* v. *Bradford*, 214 U.S. 366 (1909); *DeForest Radio Co.* v. *General Electric Co.*, 283 U.S. 664 (1931); *Mackay Radio and Telegraph Co.* v. *R.C.A.*, 306 U.S. 86 (1939); and *Funk Brothers Seed Co.* v. *Kalo Inoculant Co.*, 333 U.S. 127 (1948).

The logical application of the above-quoted principle announced in *Cochrane* to prohibit the patenting of "mental steps" and "mathematical formula or principles" was specifically recognized by the Court of Customs and Patent Appeals in *In re Yuan*, 188 F.2d 377 (1951) where Chief Judge Garret observed that "[t]his court has deemed it to have been thoroughly established . . . that purely mental steps do not form a process which falls within the scope of patentability as defined by statute." (188 F.2d at 380). *Also, see Halliburton Oil Well Cementing Co.* v. *Walker*, 329 U.S. 1 (1946) and *In re Venner*, 262 F.2d 91 (C.C.P.A., 1958).

The fact that computer programs are not suited to patent protection was also recognized by the President's Commission to study the patent laws. In recommending that computer programs not be viewed as a patentable article or "process," the Commission stated:

> The Patent Office now cannot examine applications for programs because of the lack of a classification technique and the requisite search files. Even if these were available, reliable searches would not be feasible or economic because of the tremendous volume of prior art being generated. Without this search, the patenting of programs

would be tantamount to mere registration and the presumption of validity would be all but non-existent.

It is noted that the creation of programs has undergone substantial and satisfactory growth in the absence of patent protection and that copyright protection for programs is presently available."[36]

Similarily, because of the nature of computer programs and the practical problems in conducting meaningful right-to-use searches in order to determine the present state of the art (*i.e.*, whether the claim is in fact novel and unobvious) the Patent Office promulgated guidelines in 1968 which stated that "computer programming per se, whether defined in the form of a process or apparatus shall not be patentable." *See,* Patent Office, Guidelines to Examination of Application For Patents on Computer Programs, 22 Fed. Reg. 15609 (1968). These guidelines were suspended only after the lower court issued a series of decisions, culminating in the present case, which in effect have held that computer programs are patentable as a "process" under the patent laws. *See, In re Prater,* 415 F.2d 1378 (C.C.P.A. 1968), mod. on reh. 415 F.2d 1393 (C.C.P.A. 1969); *In re Bernhart,* 417 F.2d 1395 (C.C.P.A. 1969); *In re Musgrave,* 431 F.2d 882 (C.C.P.A. 1970); *In re Mahoney,* 421 F.2d 742 (C.C.P.A. 1970); *In re Foster,* 438 F.2d 1011 (C.C.P.A. 1971); *In re McIlroy,* 442 F.2d 1397 (C.C.P.A. 1971).

Consistent with the principles set forth in the *Cochrane, Abrams* and *Yuan* decisions, *supra,* the patent

[36] "To Promote The Progress of . . . Useful Arts," Report of the President's Commission on the Patent System, Washington, D.C. 1966, U.S. Government Printing Office, at p. 13.

examiner in this case held that the claim should be denied inasmuch as it was based upon a method or algorithm, which amounted to granting a patent on an abstract principle or concept of mathematics. Although the abstract principle set forth in the algorithm is implemented through a digital computer, this fact does not alter the essential characteristic of the algorithm as a mental process. Just as the use of paper and pencil to solve a mathematical problem does not change the abstract nature of the mathematical principles involved, so also the use of a computer—the tool of the modern day mathematician—does not alter the essential mental or abstract nature of the algorithm or logical method which forms the essence of the program. As the examiner who initially reviewed the claim observed:

> The method claimed is merely a program which is a set of instructions to control the operation of a computer. The instructions are not a statutory process such as a method of manufacturing an article, but a logical list of mental steps which can be applied to a computer to allow it to imitate the mental steps (R. 18).

Similarly, as the Patent Office Board of Appeals in its opinion stated:

> The fact that a mathematician may, as an aid to his memory, routinely elect to record on a suitable medium the symbols incident to his following the procedure specified by an algorithm, such as pencil and paper or other conventional computational apparatus, does not change the basic character of the process from its being an intangible, abstract line of reasoning (R. 139).
>
> * * *
>
> Thus it is to be seen that denying to the mathematician, as the appealed claims would do, access

to the usual tools of his profession, such as pencil and paper or a programmable computer, is to deny him an opportunity to understand appellants' mathematical algorithm. Such denial is a restriction on mental process and is tantamount to granting a patent thereon. It is not seen how such restriction on mental processes could promote science or the useful arts (R. 140).

It is, thus, apparent that the claims involved in this case essentially deal with a method of applying mental concepts and not of manipulating physical things.[21] The mere fact that a computer is used as a tool for implementing the algorithm does not convert the mathematical formula or logical principles upon which it is based into a "patentable process," and the lower court's decision has misconstrued the applicable statutory provision in extending patent protection to computer programs.

C. BECAUSE MANY COUNTRIES DO NOT GRANT PATENTS ON COMPUTER PROGRAMS, SERIOUS INTERNATIONAL COMPLICATIONS WILL OCCUR UNLESS THE LOWER COURT'S DECISION IS REVERSED

The owner of a valid United States patent is protected against whoever without authority "makes, uses or sells any [such] patented invention, within the United States during the patent period . . ." 35 U.S.C. § 271(a). It follows, therefore, that the courts will protect the owner of a domestic patent against any infringement within the United States, but that pro-

[21] Normally, fact findings by the administrative tribunal are conclusive on the CCPA, unless demonstrated to be clearly erroneous. *In re Kunzmann*, 326 F.2d 424 (CCPA 1964); *Application of Wietzel et al.*, 39 F.2d 669 (CCPA 1930); *Zenith Radio Corp.* v. *Ladd*, 310 F.2d 859, 862 (D.C. Cir. 1962); and *Lyman* v. *Ladd*, 347 F.2d 482 (D.C. Cir. 1965). Thus, the findings of the Examiner and the Patent Office Board of Appeals quoted above are conclusive as to the nature of the claims in this case.

tection is limited to the territorial limits and jurisdiction of the United States. This basic principle was recognized by this Court in *Dowagiac Manufacturing Company* v. *Minnesota Moline Plow Company*, 235 U.S. 641, 650 (1915):

> . . . The right conferred by a patent under our law is confined to the United States and its territories . . . and infringement of this right cannot be predicated of acts wholly done in a foreign country.

Also, see, Laitram Corporation v. *Deepsouth Packing Co.*, . . . U.S. . . ., 40 LW 4575 (No. 71-315, Decided May 30, 1972); *Amtorg Trading Corporation*, 75 F.2d 826 (C.C.P.A. 1935), *cert. den.* 296 U.S. 576 (1935); and cases cited in Deller, Walker on Patents, Section 216, pp. 36-37 (2nd Ed. 1965).

Because many foreign countries do not recognize computer programs as patentable subject matter, a unique problem can be presented if patent protection is broadly extended to such programs under the laws of the United States. With recent technological advances, it is now possible to have instantaneous communication via satellite or transoceanic cable between a computer input device in one country and a central computer in another country. Examples of this type of arrangement are frequently found in the area of national defense and in international business transactions, *e.g.*, computerized plane and hotel reservation systems. In such instances, someone in a foreign country could easily use or copy a program on which a patent has been issued in this country and have total immunity from any infringement claims under our law.

At present, many countries in Western Europe have extensive computer installations and frequently com-

municate via satellite or transatlantic telephone lines with computers located in the United States. Yet many of these countries have laws which prohibit the granting of patents on computer programs. For example, in France a statute was recently enacted which specifically prohibits patent protection for computer programs.[33] Similarly, in the Netherlands[34] and Switzerland[35] there have been recent court decisions declaring computer programs to be ineligible for patents. The United Kingdom government has appointed a committee to examine the patent system, and last year that committee substantially recommended that patent protection not be available for computer programs.[36]

Since several countries in Western Europe have decided not to extend patent protection to computer software, a serious international legal and balance of trade problem can result if the lower court's decision in this case is affirmed. It would be quite feasible for an organization to move all its programming operations (including its programmers and mathematicians) to such countries as France, Switzerland, the Netherlands

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[33] Article 7 of the French Patent Law of January 2, 1968. An English translation appears in Industrial Property 67-75 (BIRPI, Geneva, Switz., March, 1968).

[34] A recent decision of the Patent Office Board of Appeals, on December 16, 1970, held that computer programs are not patentable under the Netherlands Patent Act. BIE No. 2, February 15, 1971.

[35] Computer programming inventions are currently considered unpatentable in Switzerland as the result of a Swiss Patent Office decision of September 3, 1968. Patent Master Und Markenblatt 68-1-53.

[36] The British Patent System, Report of the Committee to Examine the Patent System and Patent Law, Cmnd. No. 4407, at 144 (July, 1970).

and the United Kingdom, and then copy or use programs on which patents had been issued in this country. Because of the availability of instantaneous communication between Western Europe and the United States, it would then be possible to use the patented program in Europe and communicate the result directly to a computer located in the United States. Under these circumstances, the domestic patent would be rendered virtually meaningless, and the chief effect would be on our domestic economy. Among other things, such a result would constitute an unfortunate and avoidable violation of United States employment and trade policy.

D. ADDITIONAL PROPRIETARY RIGHTS IN COMPUTER PROGRAMS SHOULD BE OBTAINED THROUGH LEGISLATION AND NOT THROUGH A DISTORTION OF THE PATENT LAWS

BEMA recognizes that some form of proprietary rights in computer programs is appropriate to prevent unauthorized copying and use. In certain limited instances the amount of time, energy and money devoted to the development of certain types of programs should entitle the developer to protection. Copyright registration has been available for several years and, in addition, individual BEMA members have recommended that Congress enact laws granting a specific and tailor-made proprietary right for computer programs. Accordingly, if proprietary protection under federal statute, other than copyright, is considered necessary for computer programs, this result should be accomplished through legislation and not through a distortion of the patent laws.

In 1964, the Copyright Office determined that computer programs can be registered under the copyright

laws if certain requirements are met.[36] Since that announcement, several hundred such programs have been registered with the Copyright Office and by this means the author can prevent their copying in the form expressed. Of course, the existence of copyright protection does not prevent someone from individually arriving at the same result through his own efforts, and a copyright can only protect the form of expression used in a particular program.[37]

Those who are of the opinion that some protection in addition to copyright protection is needed recognize that because of the unique nature of computer programs a specific tailor-made system of proprietary rights is appropriate. Precedent for such an approach can be found in other areas where Congress has enacted special statutory provisions to cover a unique or special technology. For example, in the case of asexually produced plants, special provisions in the patent law have been enacted to protect new developments in this field.[38] Similarly, Congress has enacted special provisions in

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[36] *See*, U.S. Copyright Office Announcement SML-47 (May 19, 1964). Three conditions which software must meet for copyright protection are: (1) original authorship; (2) publication of copies in a form perceptible or capable of being perceptible to the human eye; (3) depositing copies for registration to consist of or include reproductions in a language intelligible to human beings.

[37] "The Uneasy Case For Copyright: A Study of Copyright In Books, Photocopies and Computer Programs," 84 Harv. L. Rev. 344, n. 247 (1970); "Copyright Protection for Computer Programs," 64 Colum. L. Rev. 1274 (1964); "Scope of Protection For Computer Programs Under the Copyright Act," 14 DePaul L. Rev. 360 (1964); "Computers, The Copyright Law and Its Revision," 20 U. Fla. L. Rev. 386 (1968); Cary, "Copyright Registration and Computer Programs," 11 Bull. Copyright Soc'y 361 (1964).

[38] 35 U.S.C.A. § § 161-164.

the copyright law with respect to phonograph records and tapes.[39]

At present, there are several bar association committees and various industry groups which are studying this problem,[40] and several legislative proposals have been under active consideration by the Congress since the report of the President's Committee on the patent system was issued in 1966. These proposals would create a special form of legal right specifically for the computer programming field,[41] and the existing patent law should not, and need not, be distorted in order to accomplish this result.

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[39] 17 U.S.C.A. § 1(f), as amended October 15, 1971, Pub. L. 92-140, § 1(a), 85 Stat. 391.

[40] Among the committees studying this problem are: Patent, Trademark & Copyright Section of the American Bar Association, Committee 408; Committee on Information Retrieval, American Patent Law Association; and Coordinating Committee of the National Council of Patent Law Associations established at the behest of the Commissioner of Patents.

[41] *See,* Galbi: "Software and Patents: A Status Report," 14 *Communications of the ACM* 274 (April, 1971); "Computer Program Protection: The Need To Legislate A Solution," 54 Cornell L. Rev. 586 (1969); Law of Software Conference, Computers-in-Law Institute, National Law Center, 1969 Proceedings, George Washington University.

IV.

CONCLUSION

For the foregoing reasons we respectfully submit that computer programs should not be eligible for patent protection and that the lower court's decision should be reversed.

Respectfully submitted,

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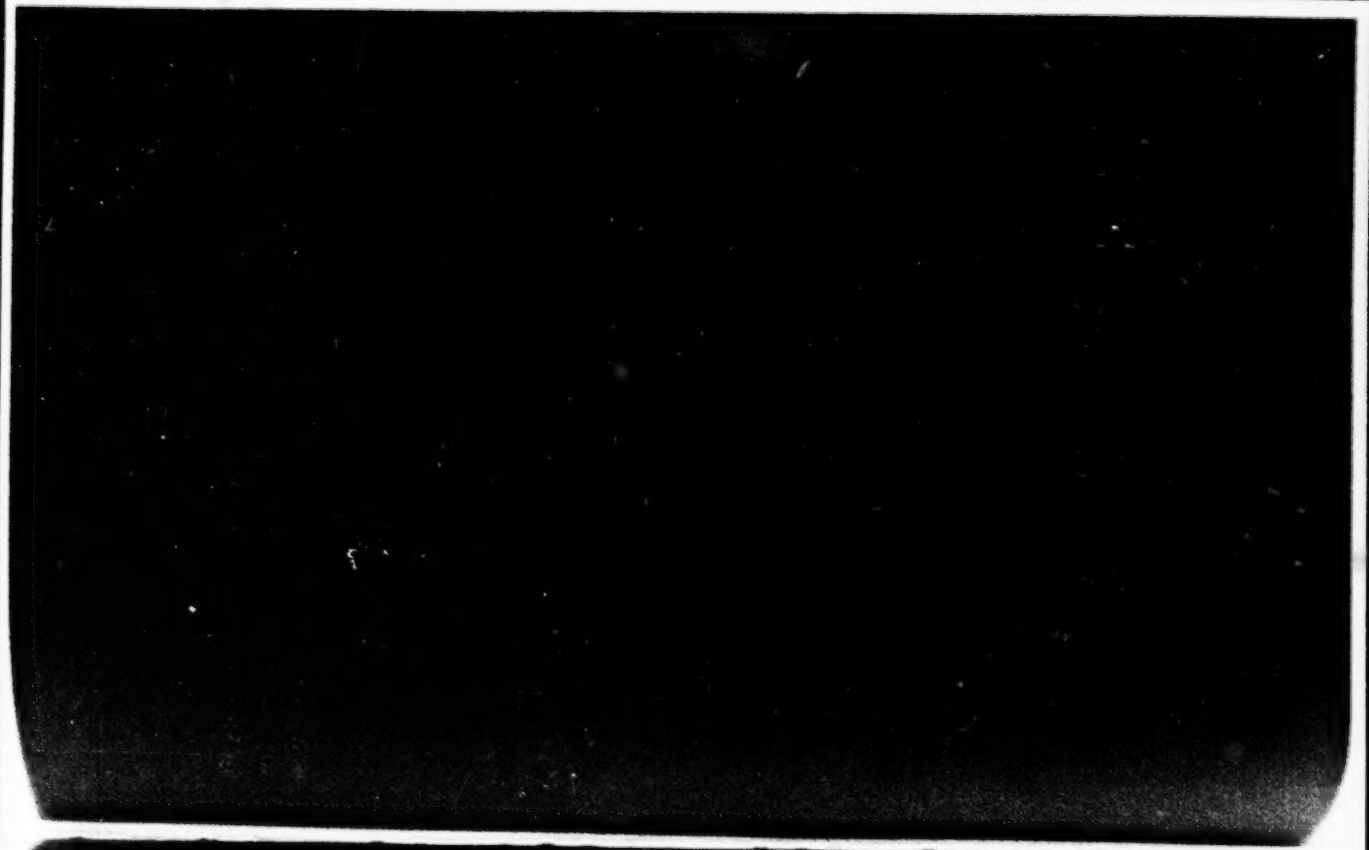

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In the Supreme Court of the United States

OCTOBER TERM, 1971

No. 71-485

ROBERT GOTTSCHALK, COMMISSIONER OF PATENTS,
PETITIONER

v.

GARY R. BENSON AND ARTHUR C. TABBOT

ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS

BRIEF FOR THE PETITIONER

OPINION BELOW

The opinion of the Court of Customs and Patent Appeals (Pet. App. 17–31) is reported at 441 F. 2d 682. The opinion of the Patent Office Board of Appeals is reprinted at Pet. App. 36–41.

JURISDICTION

The judgment of the Court of Customs and Patent Appeals (Pet. App. 32) was entered on May 6, 1971. On July 26, 1971, Mr. Justice Black extended the time for filing a petition for a writ of certiorari to October 3, 1971. The petition was filed on October 4, 1971, and was granted on February 22, 1972. The

jurisdiction of this Court rests on 28 U.S.C. 1256. *Brenner* v. *Manson*, 383 U.S. 519.

QUESTION PRESENTED

Whether a method of converting numerical information from binary-coded-decimal numbers into pure binary numbers, for use in programming conventional general-purpose digital computers, is patentable.

CONSTITUTIONAL AND STATUTORY PROVISIONS INVOLVED

Article I, Section 8, Clause 8, of the Constitution of the United States provides:

> The Congress shall have Power * * *
>
> * * * * * * *
>
> To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries,

35 U.S.C. 100(b) provides:

> The term "process" means process, art or method, and includes a new use of a known process, machine, manufacture, composition of matter, or material.

35 U.S.C. 101 provides:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

STATEMENT

In October 1963 respondents, represented by Bell Telephone Laboratories, Inc., filed in the Patent Office "Application Serial Number 315,050, for Conversion of Numerical Information" (R. 3).[1] The invention alleged by respondents related "to the processing of data by program and more particularly to the programmed conversion of numerical information" (R. 3, 142) in general purpose digital computers. Specifically, respondents claimed a method for converting binary-coded-decimal (BCD) numerals into pure binary numerals (R. 3). See *infra*, pp. 7–13. The claims were not limited to any particular art or technology (such as pharmacy or telephony), to any particular apparatus or machinery (such as a steam engine or telephone switching system), or even to any particular end use (such as controlling the speed of motors or converting telephone dial signals from one form to another). Rather, they broadly covered any use of the claimed method in a general purpose digital computer of any type (see Resp. Br. in Opp., p. 1). Claims 8 and 13 of the amended application were rejected by the Patent Office (Pet. App. 36–41), but were sustained by the Court of Customs and Patent Appeals (Pet. App. 27–31). They are the claims involved here.[2]

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[1] "R." refers to the printed transcript of record in the Court of Customs and Patent Appeals.

[2] Claim 8 reads (R. 142–143, Pet. App. 19):

"The method of converting signals from binary coded decimal form into binary which comprises the steps of—

(1) storing the binary coded decimal signals in a reentrant shift register,

(2) shifting the signals to the right by at least three places,

1. DIGITAL COMPUTERS

Computers are devices that solve problems involving numerical information or data convertible to numerical form. These devices have developed in two

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until there is a binary "1" in the second position of said register,

(3) masking out said binary "1" in said second position of said register,

(4) adding a binary "1" to the first position of said register,

(5) shifting the signals to the left by two positions,

(6) adding a "1" to said first position, and

(7) shifting the signals to the right by at least three positions in preparation for a succeeding binary "1" in the second position of said register."

Claim 13 reads (R. 143, Pet. App. 19–20):

"A data processing method for converting binary coded decimal number representations into binary number representations comprising the steps of—

(1) testing each binary digit position *i*, beginning with the least significant binary digit position, of the most significant decimal digit representation for a binary "0" or a binary "1";

(2) if a binary "0" is detected, repeating step (1) for the next least significant binary digit position of said most significant decimal digit representation;

(3) if a binary "1" is detected, adding a binary "1" at the (i+1)th and (i+3)th least significant binary digit positions of the next lesser significant decimal digit representation, and repeating step (1) for the next least significant binary digit position of said most significant decimal digit representation;

(4) upon exhausting the binary digit positions of said most significant decimal digit representation, repeating steps (1) through (3) for the next lesser significant decimal digit representation as modified by the previous execution of steps (1) through (3); and

(5) repeating steps (1) through (4) until the second least significant decimal digit representation has been so processed."

branches. One branch operates by use of an analogy between measurements of continuous data within the computer system and the system being studied. These are known as analogue computers.[3] In contrast, a digital computer, as its name implies, operates on data expressed in digits, i.e., discrete and discontinuous numerical elements. The difference between a digital computer and an analogue computer is essentially the difference between counting and measuring. "A digital computer solves a problem by actually doing arithmetic in much the same way a person would by hand."[4]

In a digital computer, the digits are represented in physical form. Some of these representations are permanently retained or stored as components of the computer. For example, Pascal's adding machine, built in 1642, used ten-toothed gears whose positions represented digits in the decimal number system. The gears in effect functioned as a storage unit or "digit register." A "digit register" is any device which retains the physical representation of a digit, and can be in the form of gears, electrical switches, or electronic circuitry.[5] In addition to the numbers permanently stored in digit registers, other numerical data must—in order for a digital computer to be operated—be put into the computer in a form discernible to its computer mechanism. In a calculating machine,

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[3] The patentability of analogue computer systems is not involved in this case.

[4] Benray, *Understanding Digital Computers* (1964) p. 4.

[5] Stibetz and Larrivee, *Mathematics and Computers*, 47, 96–97.

a human operator manually inserts data by operating a keyboard. In an automatic digital computer, groups or sequences of arithmetical operations are performed without need for continuous human intervention in the process.[6] Such a computer operates under the control of a set of stored internal instructions, which can be invoked by further instructions discernible to the computer, so that they operate upon both new and previously stored data.

In modern digital computers the representation of numbers may be in the form of a time-series of electrical pulses, magnetized spots on the surface of tapes, drums, or discs, charged spots on cathode ray tube screens, or the presence or absence of punched holes on paper cards, or may be accomplished by means of other discontinuous electrical or physical conditions which can be assigned discrete digit values for each permitted physical state. The computing process is controlled by arranging or processing sets of signals (such as electrical pulses), in the proper sequence, in a form compatible with the computer's internal characteristics. The system of arrangement of the signals is the "program"—"a sequence of coded instructions for a digital computer" (Webster's Third New International Dictionary, p. 1812).[7] Through the instruc-

[6] See McCormick, *Digital Computer Power*, p. 4 (1959).

[7] The basic parts of a digital computer are its (1) input, (2) storage unit, (3) arithmetic and logic unit, (4) control unit, and (5) output. Data and instructions are inserted into the computer at the input. The storage unit receives data, and holds it for subsequent use or retrieval. The arithmetic and logic unit consists of various circuits for performing multiplication, division, and other arithmetical or logical operations. The control unit includes the circuits that effect selection and retrieval of

tions must be expressed in a form which the computer is designed to recognize, the program itself is merely a sequence of mathematical steps into which the problem the computer is solving can be broken down. While the computer operates by physical equivalents of logical functions, the functions themselves are the same procedures which a human being would perform in working the same computation, but reduced to the physical characteristics of the device.

It is possible to build a computer so that its hardware elements perform only the operations called for by a particular program. But this would require a different computer for each operation and would render use of computers prohibitively expensive. Instead, therefore, general purpose computers, which can perform operations under many different programs, are used. The programs are the variable operating factors which give the computer's hardware circuitry its general utility.

2. MATHEMATICAL ELEMENTS OF RESPONDENT'S CLAIMS: THE BINARY NOTATION SYSTEM, ALGORITHMS, DECIMALS, BINARY CODED DECIMALS, AND PURE BINARY NUMBERS

Digital computer data is automatically recorded or "coded" by means of the binary notation system, a method of numerical representation using as digits

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instructions from storage or from outside the computer, in proper sequence, and the carrying out of each of the coded instructions by generation and application of proper signals to the appropriate units. See generally Benray, *supra*.

only two characters or symbols—*0* and *1*. These symbols are arranged in a system of place values based on ascending powers of the number 2.[8] The binary notation system is used because the two symbols *0* and *1* may be correlated with the logical and mathematical functions of the concepts "true" and "false", or "yes" and "no", and these in turn can be physically represented by switch-like alternatives, such as the presence or absence of an electrical signal or pulse.[9] Use of the decimal number system in digital computers requires an unfeasibly complex electronic apparatus with far more intricately graded representations of the decimal characters.

Respondents seek a patent on a method of programming a general purpose digital computer to convert "signals" or "numerical representations" from binary coded decimal form (BCD) (see *infra*, pp. 11–12) into pure binary form. Any particular procedure for solving a given type of mathematical problem is known as an "algorithm".[10] The procedure which respondents set forth in their claims constitutes an algorithm, *i.e.*, a generalized formulation for programs, to solve the mathematical problem of converting from one form of numerical rep-

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[8] Binary or dyadic notation is said to have been described by the Chinese about 3000 B.C. It was reconceived in Europe by Leibniz in the 17th Century. 4 Newman, *The World of Mathematics*, 2422 (1956).

[9] Computer circuitry is usually designed on the basis of the symbolic logic conceived in 1854 by George Boole to express Aristotelian logic algebraically. Benrey, *supra*, at p. 49.

[10] The Random House Dictionary of the English Language (1966 ed., p. 37).

resentation to another. Although respondents have submitted two specific programs embodying this algorithm to the Patent Office (one to the Examiner, in the application itself, and one on appeal to the Board, see R. 9, 81), the claims themselves (*supra*, n. 2) are directed to the generic formulation set out in the algorithm. From this formulation particular programs may be developed as specific applications (R. 139; Pet. App. 39–40).[11]

A brief description of the decimal, pure binary, and BCD systems will be helpful in understanding respondents' claims.

Decimal notation is commonly used to represent numerical information. For graphic representation purposes, the decimal system uses as digits the ten characters or symbols *0, 1, 2, 3, 4, 5, 6, 7, 8,* or *9,* arranged in a numerical sequence such that the value contributed to the numeral by any digit depends, as it does in any positional system of notation, both on its individual value and on its relative position in the numeral.[12] The positional values for digits increase in

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[11] Different computers have different internal circuits and apparatus; accordingly, they require different specific programs (adapted to the particular characteristics of the computer involved) to carry out the algorithm which solves a particular problem. Hence, numerous different specific programs may apply the same algorithm.

[12] To avoid confusion, the term "numeral" is used here to refer to the entire numerical expression, and the term "digit" is used to refer to the members thereof. Thus, in the usage employed here, 6 is the digit in the tens position in the decimal numeral (365) that represents the number of days in a year. The same numbers can be represented as the Roman numeral CCCLXV. See generally American National Stand-

consecutively ascending powers of 10 from right to left. Decimal numerals are written by placing digits in the appropriate positions or columns of the numerical sequence, *i.e.*, "units" (10^0), "tens" (10^1), "hundreds" (10^2), "thousands" (10^3), etc.[12] Accordingly, the numeral 1492 signifies $(1\times10^3)+(4\times10^2)+(9\times10^1)+(2\times10^0)$.

The pure binary system of positional notation uses two symbols as digits, *0* and *1*, placed in a numerical sequence with values based on consecutively ascending powers of 2. These values increase from right to left, just as the position values of decimal numerals increase from right to left in consecutive powers of 10. In pure binary notation, what would be the tens position of a decimal numeral is thus the twos position; similarly, pure binary's fours position corresponds to decimal's hundreds, and pure binary's eights to decimal's thousands. When *1* fills a digit position in binary, it carries the value of 2 to the power for that position; when *0* fills it, the position has no value (or zero times the value assigned to the position). The position to the farthest right (the units column) distinguishes odd and even numbers. When this position is filled with *1*, the sequence of digits represents an odd number; when it is filled with *0*, it represents an even number.

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ard Vocabulary for Information Processing, Standard No. X3.12–1970, adopted by Office of Management and Budget, October 16, 1970; Standard Dictionary of Computers and Information Processing (Weik ed.).

[12] In exponential notation of this type, the power of ten corresponding to the "units" position is zero, and $10^0=1$. Similarly, $2^0=1$.

Any decimal number from 0 to 10 can be represented in the binary system with four digits or positions. Thus the following table can be compiled:

Decimal	Shown as the sum of powers of 2				Pure Binary
	2^3 (8)	2^2 (4)	2^1 (2)	2^0 (1)	
0 =	0 +	0 +	0 +	0	= 0000
1 =	0 +	0 +	0 +	2^0	= 0001
2 =	0 +	0 +	2^1 +	0	= 0010
3 =	0 +	0 +	2^1 +	2^0	= 0011
4 =	0 +	2^2 +	0 +	0	= 0100
5 =	0 +	2^2 +	0 +	2^0	= 0101
6 =	0 +	2^2 +	2^1 +	0	= 0110
7 =	0 +	2^2 +	2^1 +	2^0	= 0111
8 =	2^3 +	0 +	0 +	0	= 1000
9 =	2^3 +	0 +	0 +	2^0	= 1001
10 =	2^3 +	0 +	2^1 +	0	= 1010

Binary-coded-decimal (BCD) numerals employ concepts of both the decimal and the pure binary systems. In the BCD system decimal numerals are symbolized in terms of the first ten binary numerals. This is done by replacing the character for each component decimal digit in the decimal numeral with the corresponding four-digit binary numeral (see the right column of the preceding table). The numerical value contributed by each four-binary-digit member of a BCD numeral depends, as it does in the ordinary decimal system, both on its individual value and on its position in the sequence, and the positional values assigned are the ordinary decimal units, tens, hundreds, etc. For example, decimal 53 is represented as 0101 0011 in BCD, because decimal 5 (as shown in the preceding table) is equivalent to binary 0101; and

decimal 3 is equivalent to binary 0011. Accordingly, the BCD numeral should be understood as 0101 tens plus 0011 units. In pure binary notation, however, in which binary place values are used rather than decimal place values, decimal 53, which is $2^5+2^4+0+2^2+0+2^0$ $(32+16+0+4+0+1)$, equals binary 110101.

For some computer operations it is desirable to convert from the BCD system to the pure binary system. The conversion of BCD numerals to pure binary numerals can be accomplished by a conventional series of mental steps, through the use of the preceding table showing binary equivalents of decimal numerals from 0 to 9, and by the mathematical processes of addition and multiplication by the rules of the binary number system (see Pet. App. 33–35).[14] The respondent applicants vary the ordinary arithmetic steps that a human being would use to accomplish such a conversion, by changing the order in which they are accomplished, changing the symbolism for writing the multiplier used in some steps (using a blank space for a terminal zero), and by taking subtotals after each successive operation (*ibid.*).[15] No

[14] The conversion procedure involves taking the sum of one times the BCD units digit, plus ten times the BCD tens digit, plus one hundred times the BCD hundreds digit, etc.—with all the addition and multiplication operations carried out in binary. Thus, decimal 53, which, in BCD, is 0101 0011 (see above), is $0101\times1010+0011\times0001$. Performing the multiplications, this is $110010+0011$; and then performing the addition, the result, in pure binary, is 110101, as indicated above.

[15] The latter may be considered an ordinary intermediate step in the use of computers, because typically a computer will add only two numbers together at a time, take the sub-total, then go

new machinery or hardware is necessary to complete the series of logical or mathematical steps described. The mathematical procedures recited in the claims can be carried out in existing computers long in use; they can also be performed without a computer, as the respondents showed before the Patent Office (see Pet. App. 33; R. 23).

3. THE PROCEEDINGS

The Patent Office examiner rejected claims 8 and 13 as unpatentable "nonstatutory subject matter" under 35 U.S.C. 101, on the ground that the program described in the claims was not a "process" within the statutory definition of 35 U.S.C. 100(b), but merely a series of mathematical calculations or mental steps (R. 135–136; see Pet. App. 21). The Patent Office Board of Appeals made the same determination and rejected the claims (Pet. App. 36–41). The Board rejected the applicants' argument that, despite the breadth of the claims, the subject matter came within the ambit of Section 101 because the descriptive portion of the application indicated that the method was intended for use in a machine (Pet. App. 38–39):

> We are not convinced by appellants' arguments to the effect that the disclosure in an application, not the claims thereof, should be the proper basis for judging whether the claims are drawn to subject matter outside the statute.

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n to add the next number to the sub-total, and so on—rather han adding all the numbers, or all the digits of a given digit osition for all the numbers, at once as a human does.

> Certainly a claim which embraces that which was already in the prior art or was obvious therefrom could not be sustained under 35 U.S.C. 102 or 103 merely because there may have been something patentable disclosed in the specification. 35 U.S.C. 112 requires the claim to point out the subject matter which the applicant regards as his invention so that a claim which is so broad and indistinct as to embrace within its terms subject matter that cannot be patented under section 101 of the statute, similarly must be unpatentable.

The Court of Customs and Patent Appeals reversed,[16] holding that the claimed method does qualify as statutory subject matter (a "process") under 35 U.S.C. 101 (Pet. App. 17–31). Citing with approval a concurring opinion in one of its own recent decisions to the effect that "'in reality very little remains * * * of the "mental steps" doctrine'" (Pet. App. 27), the court noted that the processes in question are "machine implemented" (claim 8) (Pet. App. 28) or are of "no practical use other than the more effective operation and utilization of a * * * digital computer" (claim 13) (Pet. App. 31). Therefore, the court reasoned, the alleged process is in the "technological" or useful arts and, consequently, is statutory subject matter patentable under 35 U.S.C. 101 (Pet. App. 31).

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[16] Under the administrative and judicial review system for patent applications, the role of the Court of Customs and Patent Appeals corresponds to that of a court of appeals in reviewing decisions of other administrative agencies (see 35 U.S.C. 141–146; see generally *Brenner* v. *Manson*, 383 U.S. 519, 524–527). The Board of Appeals is the administrative agency. See 35 U.S.C. 7, 134; 37 C.F.R. 1.196.

SUMMARY OF ARGUMENT

I. The patent system has, from its inception, been directed solely to the pragmatic application of ideas, and not to ideas and principles themselves. The underlying rationale of the limitation of patentability to the pragmatic application of ideas is that ideas and mental processes as such—no matter how complex—are the basic currency of "tools" of scientific development, whose free exchange must not be hindered by the granting of monopolies.

The "discovery" which respondents claim here is nothing more than a sequence of mathematical steps which differ very little from the mental steps that an ordinary human being could be expected to follow. Their theorem follows automatically from the definitions of pure binary, decimal, and BCD numbers and from the axioms for or definitions of addition and multiplication in the binary system, and, therefore, is not the kind of "discovery" contemplated either by the patent clause of the Constitution or by Section 101 of the Patent Code.

Even assuming *arguendo* that respondents' procedure is more than an obvious extension of known mathematical principles, their claims are entirely without limitation as to end use or apparatus, and, consequently, embrace any and all known and unknown purposes or uses for their mathematical procedure. Under this Court's decisions, therefore, respondents' claims fall substantially short of the statutory standard of patentability. Compare *O'Reilly* v. *Morse*, 15 How. 62, with *The Telephone Cases*, 126 U.S. 1. Neither of

respondents' claims at issue here contains a use limitation, and only claim 18 even arguably asserts an apparatus limitation, by referring to a "shift register", which implies that the claimed method will be carried out by a digital computer or other device utilizing such a mechanism.

This general apparatus reference is insufficient to confer patentability on respondents' method, both because of its undue breadth and because there is no finding or allegation that the mathematical principle respondents claim synergizes with the computer or cooperates with it in some new and unconventional way that makes for invention. Respondents' assertion that they could have disclosed specially-designed wire circuits that were a permanent physical part of a machine built to carry out the procedures they claim is doubtful at best, but, in any event, is irrelevant to the issue before this Court, which is whether the Patent Office properly rejected the claims that respondents in fact presented. Respondents' assertion that they plan to use their method in a "stored-program-controlled electronic telephone switching system for converting dial signals into binary signals" (Resp. brief in Opp., pp. 1–2) is also irrelevant to the issue in this case, because the asserted end use is not an element of the claim which respondents presented to the Patent Office.

The decision below is thus incompatible with the decisions of this Court which hold that pure mental processes are not patentable. If allowed to stand, the decision would grant monopoly protection to ideas which have always been part of the public domain and which are part of the common intellectual property

that every member of society has the right to apply to existing and future machinery and technology.

II. Categorization of computer programming methods such as those claimed by respondents as patentable subject matter would tend to undermine the present patent system. There is at present no adequate system of classification, searching technique and research files for the rapidly expanding volume of art in this area. Indeed, it is highly doubtful whether the criteria for examination of patent applications required by this Court in *Graham* v. *John Deere*, 383 U.S. 1, 18–19, can effectively be applied to applications for patents on computer programs. The President's Commission on the Patent System [illegible] expressed substantial doubt that an effective system for classifying computer programming art can be devised. The difficulties of devising such a system are inherent in the classification of broad abstract mental processes, and are an additional reason why the Court ought not to discard the mental steps doctrine. If protection of some kind is desirable for computer programs, the responsibility for devising and delimiting such protection should be left to Congress.

ARGUMENT

I

THE CLAIMED PROCESS IS UNPATENTABLE BECAUSE IT IS NO MORE THAN A SET OF MENTAL STEPS FOR CARRYING OUT MATHEMATICAL PROCEDURES

Since the first patent law was enacted in 1790 (1 Stat. 109), the patent system has been directed solely

to the pragmatic application of ideas. Thus, patents have been issued only with respect to specific and tangible machinery, articles of manufacture, chemical and other physical compositions, and processes for making or using such machinery, articles of manufacture, and compositions (35 U.S.C. 100(b), 101),[17] in a specific useful way. *Brenner* v. *Manson*, 383 U.S. 519. These four classes alone—"machines," "articles of manufacture," "compositions," and "processes" for making or using them, 35 U.S.C. 101—are the categories of statutory subject matter. Principles and ideas, as contrasted with the specific and tangible application of those ideas to a specific use, have always constituted nonstatutory subject matter which cannot qualify for the monopoly grant embodied in a patent. *Le Roy* v. *Tatham*, 14 How. 156, 174–175; *Rubber-Tip Pencil Co.* v. *Howard*, 20 Wall. 498, 507; *Mackay Radio & Tel. Co.* v. *Radio Corporation*, 306 U.S. 86, 94.[18]

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[17] The four statutory classes go back to the 1793 Act (1 Stat. 318; see also similar wording of the original 1790 Act, 1 Stat. 109; *Graham* v. *John Deere Co.*, 383 U.S. 1, 6–7), and have remained unchanged, except that in the 1952 Act the word "process" replaced the prior term "art". This verbal change was made only for reasons of clarity and did not reflect a substantive change in the scope of patentability. See Revisor's Note, 35 U.S.C. 101.

[18] There are two types of nonstatutory subject matter. The first is that which is not covered by inclusion in the four statutory categories of Section 101. The other type is that which may fit within one of the four categories but is nonetheless [redacted] excluded, expressly or by implication, in other provisions of law. Atomic weapons, for example, are expressly excluded (42 U.S.C. 2181(a)). Ornamental designs for articles of manufacture are patentable under 35 U.S.C. 171, and are excluded by implication from Section 101.

The statutory restrictions on patentability reflect the limited concept of "Discoveries" which advance the "useful Arts" for which the Constitution authorizes the grant of monopoly protection. See *Graham* v. *John Deere Co.*, 383 U.S. 1, 5–6. The underlying rationale of the limitation of patentability to the pragmatic application of ideas is that ideas as such—scientific principles, laws of nature, mental processes and abstract intellectual concepts—are the basic currency or mental tools of scientific and technological development, whose free exchange must not be hindered by indiscriminate granting of patent monopolies, lest the result be to obstruct, rather than promote, "the Progress of Science and useful Arts." Art. I, Section 8, Clause 8. See the selection from letter of Thomas Jefferson quoted in *Graham* v. *John Deere Co.*, 383 U.S. 1, 8, n.2. For that reason, the Pythagorean Theorem, the binomial theorem, Gibbs' vectors, the Laplace Transform, the general theory of relativity, and Russell's theory of types, for example, even though the products of great intellectual effort, or a flash of genius, are not patentable under our law. Mathematical theorems, abstractions, ideas, and laws of nature are the property of everyone and the exclusive right of no one.

The "discovery" which respondents claim here is that BCD numerals may be converted into binary numerals by multiplying the hundreds digit by one hundred, multiplying the tens digit by ten, and multiplying the units digit by one, according to the rules of multiplication in the binary system, and then adding these products together, according to the binary

rules for addition. The process which they claim to have discovered is nothing more than a sequence of mathematical steps (or arithmetical calculations) that are analogous, for example, to a method for the conversion of Roman into Arabic numerals, or the method of solving a quadratic equation by "completing the square." The applicants' process differs only in some minor respects from the mental steps that an ordinary human being could be expected to follow (see pp. 12–13, *supra*). In effect, they seek a patent grant on a theorem that follows automatically from the definitions of pure binary, decimal, and BCD numbers, and from the axioms for or definitions of addition and multiplication in the binary system. And whether the theorem is elementary (as we believe it is) [*] or complex makes no difference, for what is claimed here is not the kind of patentable "discovery" contemplated either by the patent clause of the Constitution or by Section 101 of the Patent Code. Indeed, the Court has repeatedly held that a scientific principle, rule, formula or mathematical expression is not a patentable process, regardless of the novelty or importance of the discovery. *Le Roy* v. *Tatham, supra; Mackay Radio & Tel. Co.* v. *Radio Corporation, supra; O'Reilly* v. *Morse*, 15 How. 62;

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[*] Indeed, though this issue was not argued in the Court of Customs and Patent Appeals, it is doubtful whether the mathematical procedure respondents claim here involves "invention" or is sufficiently nonobvious to those familiar with the art to meet the requirements of 35 U.S.C. 103.

Tilghman v. *Proctor*, 102 U.S. 707; *Risdon Iron and Locomotive Works* v. *Medart*, 158 U.S. 68.[20]

As the Court observed in *Funk Bros. Seed Co.* v. *Kalo Co.*, 333 U.S. 127, 130:

> He who discovers a hitherto unknown phenomenon of nature has no claim to a monopoly of it which the law recognizes. If there is to be invention from such a discovery, it must come from the application of the law of nature to a new and useful end.* * *

Even assuming, therefore, that the applicants' mathematical procedure was the fruit of their discovering hitherto unknown and unobvious mathematical principles, their claims are so abstract and sweeping as to cover any and all known and unknown purposes or uses for this method for BCD-to-pure-binary conversion, whether in the operation of a telephone, a railroad train, a credit-card verification system, a customer-operated instant cash withdrawal banking system, or Shepardizing law reports,[21] and whether carried out by means of any presently-

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[20] See also *Don Lee Inc.* v. *Walker*, 61 F. 2d 58 (C.A. 9); *Halliburton Oil Well Cementing Co.* v. *Walker*, 146 F. 2d 817 (C.A. 9). Cf. *Burr* v. *Duryee*, 1 *Wall.* 531, 570, *Fuller* v. *Yentzer*, 94 U.S. 288; *Baker* v. *Selden*, 101 U.S. 99, 103.

[21] These examples involve typical human-machine interfaces, where the human side is necessarily in decimal and the machine side in binary. The human input to a law report citator, for example, would have to be in decimal form, because that is how law reports are paginated and cited. The data will be stored, however, in binary form, for convience and economy. As the court below indicated (Pet. App. 18), the conversion from decimal citation to a form compatible with binary storage will probably require a BCD-to-binary conversion.

known or future-devised machinery. By seeking to claim their mathematical procedure without limitation as to end use or apparatus, respondents have placed themselves outside the statute.

The decided cases do not settle the precise point at which a method patent claim utilizing a mathematical formula or series of mental steps is sufficiently limited by reference to a specific end use and apparatus to come within the statutory categories of patentability. Comparison of two landmark cases decided by this Court, however, shows that respondents' claim in this case falls substantially short of the statutory standard. In *O'Reilly* v. *Morse*, 15 How. 62, the Court struck down the claim made by the inventor of the telegraph to a patent monopoly on the use of electricity to print characters at a distance.[*] Morse had also developed a particular apparatus which would exploit the principle he had discovered. The Court held that he was entitled to the exclusive right to that particular apparatus, but not to the principle itself or to any apparatus which others might in the future devise to exploit the method of conveying messages by electricity. 15 How. at 112-119. The lack of apparatus limitation was fatal to Morse's general claim.

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[*] Morse's eighth claim read:

"I do not propose to limit myself to the specific machinery * * * described in the foregoing specification and claims; the essence of my invention being the use of the motive power of the electric or galvanic current, which I call electro-magnetism, however developed for marking or printing intelligible characters * * * at any distance, being a new application of that power of which I claim to be the first inventor or discoverer" (15 How. at 112).

By comparison, the claim which this Court upheld in *The Telephone Cases*, 126 U.S. 1, 537–538, had both use limitations indicating a particular field of art and significant apparatus limitations, which together gave reasonable boundaries to the claimed monopoly. First, the claimed use was confined to telephone systems and did not extend to other technical or nontechnical arts —a limitation that respondents have not placed upon the monopoly they seek here. Second, the Court noted that the applicants' claims were limited to the method they had devised as practiced with only two particular types of microphone and loudspeaker apparatus."

We submit that respondents' claims at issue here (*supra*, n. 2) fall significantly considerably short of the limitation requirements that emerge from the foregoing decisions of this Court. These cases show that claims for methods exploiting natural principles or laws (including the laws of physics or mathematics), if they are patentable at all, are patentable only when they contain proper limitations both (1) confining the monopoly over the application of the method to a specified field of technology and (2) confining the grant to a particular type of apparatus or hardware to be used

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[11] The specific apparatus to which the method claims were limited were the "magneto" apparatus, which is similar to the magnetic phonograph pickup and ordinary radio loudspeaker, and apparatus employing a variable resistance, which is similar to the ordinary carbon granule telephone mouthpiece. Bell's method claim covered the method as used with both types of apparatus, but his apparatus claim covered only the magneto system because "when Bell got his patent he thought the magneto method was the best" (*id.* at 538). The infringing use was covered by the method claim, but not the apparatus claim.

to carry out the method. Like the claims which the Court rejected in *Morse*, respondents' claim 13 has no apparatus limitations whatsoever (Pet. App. 29). Indeed, as the court below pointed out, "since the claim does not itself call for any particular hardware, the method within the claim can be practiced either with apparatus other than that described [in the application] or with the simplest of equipment" which could include " 'pencil and paper'—or even, * * * poker chips" (Pet. App. 29–30)." Nor does claim 13 have any end use limitation, which Morse did have. There is no use limitation in respondents' claim 8, either, and the only apparatus limitation in that claim is that the procedure be carried out in apparatus having a "shift register." " Since all digital computers necessarily utilize a shift register, this is at most to say

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" The court below considered the greater breadth and generality of claim 13 to be immaterial, because it seemed improbable to it that anyone would ever want to make the conversion with pencil and paper. It based this statement on the assumption (not supported by any evidence adduced before the Patent Office in this case) that "speed measured in milli- or even micro- seconds [is] essential in the practical utilization of such a process" (Pet. App. 30–31). But it is surely not proper to grant what would otherwise be an undeserved and therefore objectionable patent monopoly merely because it appears at the time of the grant that it is improbable that anyone will in the future desire to practice the subject matter of the grant. More broadly, we would consider claim 13 objectionable even if it were limited, as claim 8 is said to be, to digital computer or data processing devices—for that too is so indefinite a limitation as to leave the monopoly without any reasonable boundary (which should, of course, be properly related to the application's disclosures).

" A "shift register" is a device for "shifting" or displacing the digits of a number to the left or right. A "reentrant shift

that the apparatus should be a digital computer or other data processing device.[36]

Respondents' reference in claim 8 to a component part of a digital computer is, we submit, no more a limitation conferring patentability than would be, for example, a statement that a claimed method of adding, subtracting, or multiplying numbers is to be carried out on an adding machine or calculator.[37] Indeed, the

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register" operates cyclically, so that shifted numbers are permutated cyclically. See Pet. App. 28; see also Standard Dictionary of Computers and Information Processing (Weik ed. 1969). A "shift" is the displacement of a number to the right (down) or left (up) by one or more places or digit positions. If decimal 53 is shifted to the left, it becomes 530; shifted to the right, it becomes 5.3. In binary, shifts to the left (up) or right (down) multiply or divide the number by 2 or a power of 2. Thus shifting binary 101 (decimal 5) left one place makes it binary 1010 (decimal 10); shifting binary 101 right one place makes it binary 10.1 (decimal 2½).

[36] Claim 8 makes reference to the use of a shift register at one stage of the claimed procedure. The Patent Office Board of Appeals made an administrative determination that this language did not restrict the use of the procedure to digital computers, because the term "shift register" comprehended a piece of paper with pencilled notations on it (Pet. App. 41). The reviewing court below took the position that the term referred only to digital computers (Pet. App. 28). Whether the agency or the reviewing court is correct on the facts is immaterial, however, in our view. Even if the process is deemed limited to use in a digital computer, the limitation is too slight and indefinite to permit patentability.

[37] The court below stated that the claimed process did not seek to cover mental steps, because it was intended to be performed by an inanimate object, a programmable computer, which is a patentable machine, like cash registers and adding machines (Pet. App. 28–29). What determines whether a process is patentable, however, is the express wording and scope of the claim, itself, with particular reference to the end use and the specific

digital computer in the hands of a modern scientist is what the desk calculator was to his father or the slide rule was to his grandfather. And there is no claim here that the mathematical principle respondents claim synergizes with the computer or cooperates with it in some new and unconventional way that makes for invention. See *Anderson's-Black Rock, Inc.*, v. *Pavement Co.*, 396 U.S. 57, 61; *Great A & P Tea Co.* v. *Supermarket Equipment Corp.*, 340 U.S. 147; *Lincoln Co.* v. *Stewart-Warner Corp.*, 303 U.S. 545, 549; *Reckendorfer* v. *Faber*, 92 U.S. 347, 353–358; cf. *Deepsouth Packing Co.* v. *Laitbram Corp.*, No. 71–315, decided May 30, 1972.

Without novel and unconventional cooperation between the claimed mathematical principle or programs embodying it and the computer, the claimed method amounts to no more than another conventional use for a known machine, comparable to the insertion of a new piano roll in an old player piano. The development of such a use is not a patentable "discovery." In his famous letter to Isaac McPherson, August 13, 1813, quoted in part in *Graham* v. *Deere*, 383 U.S at 8–9, n. 2, Thomas Jefferson discussed the difficulties the original

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means of operation to be monopolized, and not merely the general nature of the apparatus on which the process is intended to be carried out. Thus, a mathematical procedure does not become patentable because it is for use in a digital computer. As the Board of Appeals said below (Pet. App. 39):

> The fact that a mathematician may, as an aid to his memory, routinely elect to record on a suitable medium the symbols incident to his following the procedure specified by an algorithm, such as pencil and paper or other conventional computational apparatus, does not change the basic character of the process from its being an intangible, abstract line of reasoning.

patent board faced in "'drawing a line between the things that are worth to the public the embarrassment of an exclusive patent, and those which are not.'" The board developed certain general rules, however—

> One of these was, that a machine of which we were possessed, might be applied by every man to any use of which it is susceptible, and that this right ought not to be taken from him and given to a monopolist, because the first perhaps had occasion so to apply it. Thus a screw for crushing plaster might be employed for crushing corn-cobs. And a chain-pump for raising water might be used for raising wheat: this being merely a change of application. VI *Writings of Thomas Jefferson,* 182–184 (Washington ed.).

Thus, even if respondents' claimed method were confined to use in conventional, general-purpose digital computers, this would furnish no limitation that would raise it to the level of a patentable "invention" or "discovery".

Respondents also assert that they could instead have disclosed and claimed specially-designed wire circuits that were a permanent physical part of a machine built to carry out the mathematical procedures claimed here, and that therefore they should be granted a patent on the process which they did claim. We find it doubtful whether the general mathematical principle respondents claim could meaningfully be restricted to any apparatus so as to render the principle itself a patentable discovery. Indeed, there is no reason to believe that even the process of operating such special apparatus or machinery would be patentable. Under

the decisions of this Court, a process which is merely the inherent operation of a patentable machine is not itself patentable; the patent must be on the machine, not on its functioning. *Corning* v. *Burden*, 15 How. 252, 268; *Risdon Locomotive Works* v. *Medart*, 158 U.S. 68, 77; see *Application of Horvath*, 211 F. 2d 604, 607–608 (C.C.P.A.); *Philip* v. *Wildman Jacquard Co.*, 225 F. Supp. 995, 957–958 (E.D. Pa.), affirmed, 337 F. 2d 382 (C.A. 3); *Ferro Co. v. Watson*, 151 F. Supp. 167, 169 (D.D.C.). The Court of Customs and Patent Appeals has recently rejected this doctrine (*Application of Tarczy-Hornoch*, 397 F. 2d 856), but this Court, which originated the rule, has never receded from it.

In any event, the respondents' patent application did not disclose and claim any specially designed apparatus. The issue before this Court is only whether the Patent Office properly rejected the process claims that respondents in fact presented. As this Court said in regard to the unpatented fabric element of the combination patent involved in *Aro Manufacturing Co.* v. *Convertible Top Co.*, 365 U.S. 336, 339, "Whether the fabric or its shape might have been patentable is immaterial, for the fact is that neither the fabric nor its shape has been patented" (footnote ommitted).

Respondents' effort to justify their claim by reference to a limited end use is even thinner than their "limiting" reference to digital computers. Respondents assert that they *plan* to use the method in a "stored-program-controlled electronic telephone switching system for converting dial signals into binary signals" (Resp. Br. in Opp., pp. 1–2). But this intended use is not an element of the claims. As the

court below recognized, "[t]he claims in this case are directed solely to the art of data-processing" and they are in no way limited to "some subsidiary or additional art" (Pet. App. 25). Since the claims are the measure of the grant (*Aro, supra*, 365 U.S. at 339–340), the Patent Office properly relied on their express language in gaging the extent of the monopoly sought by the applicants.

Although the court below emphasized that the methods involved in respondents' claims would almost certainly be implemented by computers, and thus did not explicitly reject the reasoning of the decisions holding pure mental processes unpatentable, the instant case appears to be the most recent of a series of decisions by which the Court of Customs and Patent Appeals has eroded the long standing administrative and judicial doctrine, previously accepted by that court, that "purely mental steps do not form a process which falls within the scope of patentability as defined by statute." *Application of Shao Wen Yuan*, 188 F.2d 377, 380 (C.C.P.A.).[22] The court

[22] The term "process" as used in Section 101 of the Patent Code, and as interpreted by the Patent Office, reflects the concepts articulated in *O'Reilly* v. *Morse* and the *Telephone cases*, *supra*. Cf. *Brenner* v. *Manson*, 383 U.S. 519, 534; *Graham* v. *John Deere Co.*, 383 U.S. 1, 5–6. In *Application of Musgrave*, 431 F. 2d 882, the Court of Customs and Patent Appeals suggested that subsequent decisions of that court (see *Application of Prater and Wei*, 415 F. 2d 1378 (C.C.P.A.)) had altered the earlier standards. The instant case completes this trend by awarding patents for the mental and mathematical calculations involved in computer programming. The Court of Customs and Patent Appeals has recently re-affirmed its holding in this case. See *In re Waldbaum*, 173 U.S.P.Q. 430 (decided April 20, 1972).

recognized that, in fact, the processes involved in the method of computer programming claimed here can be implemented with any kind of equipment which enables one to convert binary coded decimal representations into pure binary numerical representations. As the Court noted, "This could *in theory* be any kind of writing * * * or even, we suppose, red and blue poker chips and a surface to put them on or slots to put them in so that '0's and '1's can be represented." Pet. App. 30. It is thus apparent, in our view, that the decision below rests on no viable distinction between the subject of respondents' claims and pure mental processes. It is therefore contrary to basic tenets of the patent law, long and consistently reflected in the decisions of this Court. Tangible apparatus and machinery for a specific use, and processes tied to specific apparatus and end uses, are patentable, while pure concepts, ideas, laws of nature, and mathematical and mental procedures are not. The latter belong in the public domain as part of the common intellectual property that every member of society has the right to apply to existing or future-devised machinery.

II

PATENTABILITY OF COMPUTER PROGRAMMING METHODS WOULD TEND TO UNDERMINE THE PRESENT PATENT SYSTEM BECAUSE THE CLAIMS IN THIS AREA CANNOT BE ADEQUATELY CLASSIFIED AND SEARCHED

In addition to the undesirable consequences of granting monopoly privileges to abstract ideas, categorization of computer programming methods such

as those claimed by respondents as patentable subject matter would create enormous problems in the administration of the patent system. As several of the *amicus curiae* briefs submitted in support of the parties in this case indicate, an extraordinary volume of art in this area is being generated at a constantly expanding rate. At present there is no adequate system of classification, searching technique and research files for computer programming. Consequently, it is highly doubtful whether the criteria for examination of patent applications required by *Graham* v. *John Deere Co., supra,* 383 U.S. at 18–19, can be effectively applied to applications for patents on computer programs. Rather, if the instant decision stands, patents issued on such applications may be little more in fact than registration certificates, the validity of which must await the test of infringement litigation. Yet, as this Court stated in *Graham* v. *John Deere Co.* (*id* at 18), "To await litigation is—for all practical purposes—to debilitate the patent system."

In the wake of the decision below and its predecessors in the Court of Customs and Patent Appeals, the Patent Office has recently initiated a pilot program, with the cooperation of the Bureau of Standards, to develop techniques for classification and searching of the computer programming art. There is no way to determine at the present time whether this effort will be successful, but the 1966 Report of the President's Commission on the Patent System (reprinted in S. Doc. No. 5, 90th Cong., 1st Sess., p. 21) recognized this problem and stated a skeptical view when it rec-

ommended that computer programs not be patented,[29] in part because it is highly questionable whether an effective system for the examination of computer programs can be developed.[30] Aside from the problems of enormous volume and the economic and personnel constraints faced by the Patent Office, the difficulties of developing an adequate examination system are inherent in the classification of broad abstract mental processes.

These difficulties, in our view, are an additional reason why the Court ought not to discard the mental steps doctrine rejected by the court below. If protection of some kind is desirable for computer programs,[31] the responsibility for devising and delimiting

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[29] Legislation to implement this recommendation by codifying into express statutory language what we believe is the existing law was introduced in the patent revision bill embodying the Report's proposals. See Section 106, S. 1042, 90th Cong. 1st Sess.: "A plan of action or set of operating instructions, in whatever form presented, to cause a controllable data processor or computer to perform selected operations shall not be patentable." The proposal is not contained in the current patent revision bill, however. See S. 643 Comm. Print, 92 Cong., 1st Sess. (Oct. 20, 1971).

[30] The Commission stated that "The Patent Office now cannot examine applications for programs because of the lack of a classification technique and the requisite search files. Even if these were available, reliable searches would not be feasible or economic because of the tremendous volume of prior art being generated. Without this search, the patenting of programs would be tantamount to mere registration and the presumption of validity would be all but nonexistent." S. Doc. No. 5, 90th Cong., 1st Sess., p. 21.

[31] For a forceful presentation of reasons why protection is not desirable, see Breyer, *The Uneasy Case for Copyright: A Study of Copyright in Books, Photocopies, and Computer Programs*, 84 Harv. L. Rev. 281; cf. Comment, *Computer Program Protection: The Need to Legislate a Solution*, 54 Cornell L. Rev. 586

such protection should be left to Congress.[32] For, in applying the patent law "in light of this Nation's historical antipathy to monopoly * * *", the courts should "require a clear and certain signal from Congress before approving the position of a litigant who * * * argues that the beachhead of privilege is wider and the area of public use narrower, than courts had previously thought." *Deepsouth Packing Co., Inc.* v. *Laitram Corp.*, No. 71–315, decided May 30, 1972, slip op., pp. 13–14.[33]

(1969); Note, *Computer Programs and Proposed Revisions of the Patent and Copyright Laws*, 81 Harv. L. Rev. 1541 (1968).

[32] Since 1964 the Copyright Office has accepted computer programs for registration. It has done so, however, subject to the restriction that the courts might ultimately declare that such programs, at least when presented in certain forms, may not be "writings" or "copies" within the meaning of the existing Copyright Act (cf. *White-Smith Music Co.* v. *Appollo Co.*, 209 U.S. 1). Copyright Office Circular No. 61. The report of the President's Commission, supra, noted that "[T]he creation of programs has undergone substantial and satisfactory growth in the absence of patent protection, and that copyright protection for programs is presently available." See generally Breyer, *supra*.

[33] The protection of computer programs is the subject of world-wide concern and is in a state of flux. In Canada, the Economic Council, an agency similar to the American Council of Economic Advisors, prepared a study on intellectual and industrial property rejecting patent or copyright protection for computer software. See Patent and Trademark Institute of Canada, Newsletter #36, August 9, 1971. Nevertheless the Canadian Patent Office has recently reversed its earlier position and has now granted a patent on a computer program. BNA Patent, Trademark & Copyright Journal, December 23, 1971, p. D-1. The British Patent Office has also done so. *Id.* It does not appear that the courts in either country have considered the issue under their respective patent statutes. The World Intellectual Property Organizations' expert advisory group, in a meeting at Geneva, March 8–12, 1971, recommended that that agency undertake a study of the factors which may constitute appropirate ingredients for a

CONCLUSION

The judgment of the Court of Customs and Patent Appeals should be reversed.

Respectfully submitted.

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system of legal protection for computer programs, but without following rigidly the lines of established legal concepts for the protection of inventions or other works. Report, *Advisory Group of Governmental Experts on the Protection of Computer Programs*, World Intellectual Property Organization, WIPO DOC AGCP/6, 1971. Some countries, such as Switzerland (see Patent Muster Und Markenblatt 68-1-53) and the Netherlands (BIE No. 2, February 15, 1971) have refused to grant patents to computer programs on the ground that programs are mental steps rather than processes.

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IN THE

Supreme Court of the United States

OCTOBER TERM 1971.

No. 71-485.

ROBERT GOTTSCHALK, ACTING COMMISSIONER OF PATENTS,

Petitioner,

v.

GARY R. BENSON AND ARTHUR C. TABBOT,

Respondents.

ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS.

BRIEF AMICUS CURIAE FOR MOBIL OIL CORPORATION.

Mobil Oil Corporation respectfully submits this brief with the consent of both parties. The letters of consent have been filed with the Clerk of this Court.

I.

QUESTION PRESENTED.

Whether the Court of Customs and Patent Appeals erred in finding the method of operation of a general purpose computer as set forth by claims 8 and 13 comprises subject matter which may be patented under 35 U. S. C. §§ 100 and 101.

II.

THE INTEREST OF AMICUS CURIAE.

Mobil Oil Corporation is a corporation originally organized August 10, 1882 under the laws of New York. Its principal business is the exploration for, production, refining and marketing of petroleum hydrocarbon on a worldwide basis. As a supporting activity Mobil has several research facilities in different parts of the country utilized for original research to develop the full potential of computer applications in its various fields of activity. Mobil's computers are in twenty-four hour a day use in processing seismic signals to identify oil bearing subsurface formations and in operation of its refineries to increase yield and to enhance quality of products therefrom. Its large expenditures in research and practical applications involving computer operation have given rise to proprietary information deemed of great value.

In order to determine company policy as to how best to protect its proprietary rights in the new methods of operation and control of computers and their use as component parts of other systems, Mobil appealed adverse decisions of the Patent Office rejecting patent claims on this technology. Mobil asked the Court of Customs and Patent Appeals to decide whether the Patent Office had changed its past practice and was correct in denying patent protection to new and different operations of computers. If the answer were to be affirmative, a company policy of seeking trade secret protection would be indicated; if negative, it would continue to publish the results of its research under the protection provided by the patent system.

III.

THE PURPOSE OF THIS BRIEF.

As a result of Mobil's appeals and the appeals of others to the court below, a body of law consistent with prior decisions of this Court has been developed. The court below has imposed safeguards to avoid overclaiming by applicants. It has insisted on full and complete disclosures of automatic systems, with claims properly drafted to define subject matter within 35 U. S. C. §§ 100 and 101 and meeting the requirements of 35 U. S. C. § 112.

Mobil's primary purpose here is to show that the recent decisions of the Court of Customs and Patent Appeals on programming technology do conform to prior decisions of this Court and statutory authority. Over the years this Court has developed case law in fulfillment of the Constitutional mandate by granting for limited times the exclusive right to discoveries in new fields of technology. As these new and previously unknown fields of technology came into being, this Court was faced with the problem of whether the new subject matter was patentable and with the question of the breadth of the claims to be granted in each new field.

This brief presents the development by this Court of the law with respect to new processes now defined in 35 U. S. C. § 100:

> (b) "The term 'process' means process, art or method, and includes a new use of a known process, machine, manufacture, composition of matter, or material."

The accepted patentability of programming technology and the leading cases of the C. C. P. A. involving new operations of computers is then presented. Because this appeal

is from an *ex parte* proceeding in the Patent Office, the record is unduly limited. Therefore, an analysis of other C. C. P. A. decisions involving new and unobvious uses of computers is necessary to provide a somewhat broader base for a review of the instant decision. These other decisions also demonstrate the care with which the C. C. P. A. has considered the subject matter.

A discussion of the *Benson and Tabbot* case itself includes a description of their method of code conversion in Appendix V of this brief. One of the key points of this appeal is the limited scope of the rejection. The Benson and Tabbot application is rejected only under 35 U. S. C. § 101, to the exclusion of other sections of the patent statutes.

Finally, this brief deals with the practice in other countries with regard to patenting programming technology.

IV.

THIS COURT DEVELOPED THE LAW OF PATENTABLE PROCESSES TO ACCOMMODATE NEW TECHNOLOGIES.

Methods and processes have been recognized as patentable subject matter since the inception of our patent system.

An early text by Willard Phillips, *The Law of Patents for Inventions*, 1837, at pages 82 et seq., provides a most interesting analysis of the then understood differences between methods and processes. Phillips suggests at page 94 that the word method has a broader signification than process. Immediately following, there is a discussion of the difference between a principle and the use or application of that principle in a useful art. The book is outstanding in its summary of earlier decisions having to do with the development of the law as of that very early date. Thus at page 100 " 'By the principles of the machine,' says the same judge, in another case, 'is meant the *modus operandi*,

the peculiar device or manner of producing any given effect.' ", citing *Whittemore v. Cutter*, 1 Gallison, 478. Phillips cites many cases to the effect that the *application* of a *principle* represents patentable subjects matter. More specifically, at page 102:

> "If by *application* be meant the mode of *operating*, or the mechanical combinations, means, or instruments, by which a principle or theory is carried into operation, in this sense, the new application of a theory or principle, may be the subject of a patent."

Again, at page 103:

> "Thus, Mr. Justice Johnson says, 'the legal title to a patent consists not in a principle merely, but in an application of a principle, whether previously in existence or not, to some new and useful purpose' (*Whitney v. Carter*, Fessenden's Pat. 130)." (All emphasis in original.)

Mr. Phillips' understanding of the law of patentable subject matter is substantiated by the following decisions of this Court.

1. The Art of Telegraphy.

O'Reilly v. Morse
56 U. S. 62 (1853)

This case brought before the Court the inventions of Samuel Morse having to do with the new art of telegraphy which created a new industry in a new field of technology. All claims before the Court except claim 8 were held valid and infringed. Of these claims, claims 6 and 8 are here relevant.

> "Sixth. I also claim as my invention the system of signs, consisting of dots and spaces, and of dots, spaces, and horizontal lines, substantially as herein set forth

and illustrated, in combination with machinery for recording them, as signals for telegraphic purposes.

"Eighth. I do not propose to limit myself to the specific machinery, or parts of machinery, described in the foregoing specifications and claims; the essence of my invention being the use of the motive power of the electric or galvanic current, which I call electro-magnetism, however developed, for making or printing intelligible characters, letters, or signs, at any distances, being a new application of that power, of which I claim to be the first inventor or discoverer." (56 U. S. 86)

Claim 6 is of interest here since this Court in 1853 recognized that in this new art the use of a code or system of signs in combination with machinery for recording them represented patentable subject matter.

The eighth claim was, as stated by the Court, too broad and not warranted by law (56 U. S. 113). Thus overclaiming was the basis of the ruling of invalidity.

The Court contrasted the overclaiming by Morse with the proper claim by one Neilson (56 U. S. 114-116). The latter had limited his process to the heating of the air by a device intermediate the blower and the furnace. Neilson had not claimed merely the discovery that hot air would promote ignition better than cold. He properly claimed a receptacle in whatever form arranged to heat the air on its way from the blower to the furnace. Thus this Court illustrated the difference between proper scope of claims and overclaiming.

2. The Art of Producing Flour.

Cochrane v. Deener
94 U. S. 780 (1876)

In this case the defendant had not used the same apparatus as disclosed in the plaintiff's Cochrane patents. There-

fore, the question was squarely presented as to whether the defendant had employed the process specified by the claim and, in particular, the extent that a process must be limited to the particular apparatus disclosed. In answering this question, the Court first stated a premise:

> "That a process may be patentable, irrespective of the particular form of the instrumentalities used, cannot be disputed. If one of the steps of a process be that a certain substance is to be reduced to a powder, it may not be at all material what instrument or machinery is used to effect that object, whether a hammer, a pestle and mortar, or a mill. Either may be pointed out; but if the patent is not confined to that particular tool or machine, the use of the others would be an infringement, the general process being the same." (94 U. S. 787, 788)

This was followed by an oft-quoted definition of a process in terms of the fact situation before the Court:

> "A process is a mode of treatment of certain materials to produce a given result. It is an act, or a series of acts, performed upon the subject-matter to be transformed and reduced to a different state or thing. If new and useful, it is just as patentable as is a piece of machinery. In the language of the patent law, it is an art. The machinery pointed out as suitable to perform the process may or may not be new or patentable; whilst the process itself may be altogether new, and produce an entirely new result. The process requires that certain things should be done with certain substances, and in a certain order; but the tools to be used in doing this may be of secondary consequence." (94 U. S. 788)

The foregoing quotations, though they seem clear enough, gave rise to questions raised in later cases as to whether the Court was setting up limits applicable to the facts of the case without foreclosing the applicability of a broader definition in the context of a different fact situation.

3. The Art of Manufacturing Fat Acids in Glycerine.

Tilghman v. Proctor
102 U. S. 707 (1880)

In this decision the Court clarified its views on process claims.

Mr. Justice Bradley described the patented invention as follows:

> "Tilghman's discovery was made in 1853, and was, in brief, this: 'That the fat acids can be separated from glycerine, without injury to the latter, by the single and simple process of subjecting the neutral fat, whilst in intimate mixture with water, to a high degree of heat under sufficient pressure to prevent the water from being converted into steam without the employment of any alkali or sulphuric acid, or other saponifying agent; . . .' ". (102 U. S. 712-13)

Whether process claims were applicable to this new technological development was answered as follows:

> "What did Tilghman discover? And what did he, in terms, claim by his patent? He discovered that fat can be dissolved into its constituent elements by the use of water alone under a high degree of heat and pressure; and he patented *the process* of 'manufacturing fat acids and glycerine from fatty bodies by the action of water at a high temperature and pressure.'

Had the process been known and used before, and not been Tilghman's invention, he could not then have claimed anything more than the particular apparatus described in his patent; but being the inventor of the process, as we are satisfied was the fact, he was entitled to claim it in the manner he did.

"That a patent can be granted for a process, there can be no doubt. The patent law is not confined to new machines and new compositions of matter, but extends to any new and useful art or manufacture." (Emphasis by the Court.) (102 U. S. 721-22)

Mr. Justice Bradley continued to present his own broad discussion of the nature of an invention in an art or process:

"It seems to us that this clear and exact summary of the law affords the key to almost every case that can arise. 'Whoever discovers that a certain useful result will be produced in any art by the use of certain means is entitled to a patent for it, provided he specifies the means.' But everything turns on the force and meaning of the word 'means.' It is very certain that the means need not be a machine, or an apparatus; it may, as the court says, be a *process*. A machine is a thing. A process is an act, or a mode of acting. The one is visible to the eye,—an object of perpetual observation. The other is a conception of the mind, seen only by its effects when being executed or performed. 'Either may be the means of producing a useful result.'" (Emphasis by the Court.) (102 U. S. 728)

4. The Art of Telephony.

The Telephone Cases
126 U. S. 1 (1887)

Famous claim 5 of the Bell patent reads as follows:

"5. The method of, and apparatus for, transmitting vocal or other sounds telegraphically, as herein described, by causing electrical undulations, similar in form to the vibrations of the air accompanying the said vocal or other sounds, substantially as set forth." (126 U. S. 531)

The opinion by Mr. Justice Waite states:

"In this art—or, what is the same thing under the patent law, this process, this way of transmitting speech—electricity, one of the forces of nature, is employed; but electricity, left to itself, will not do what is wanted. The art consists in so controlling the force as to make it accomplish the purpose. It had long been believed that if the vibrations of air caused by the voice in speaking could be reproduced at a distance by means of electricity, the speech itself would be reproduced and understood. How to do it was the question.

Bell discovered that it could be done by gradually changing the intensity of a continuous electric current, so as to make it correspond exactly to the changes in the density of the air caused by the sound of the voice. This was his art." (126 U. S. 532)

That a patentable method need not necessarily involve a change in state of matter, as in the process involved in *Cochrane v. Deener*, is made abundantly clear by this Court in the statement:

"What Bell claims is the art of creating changes of intensity in a continuous current of electricity, exactly corresponding to the changes of density in the air caused by the vibrations which accompany vocal or other sounds, and of using that electrical condition thus created for sending and receiving articulate speech telegraphically. For that, among other things, his patent of 1876 was in our opinion issued; and the point to be decided is, whether as such a patent it can be sustained." (126 U. S. 533-4)

The Supreme Court sustained the patent. They did so after a consideration of *Cochrane v. Deener* and other authorities on this point as summarized in the statement:

"Thus, an art—a process—which is useful, is as much the subject of a patent, as a machine, manufacture, or composition of matter. Of this there can be no doubt, and it is abundantly supported by authority. *Corning v. Burden*, 15 How. 252,267; *Cochrane v. Deener*, 94 U. S. 780,787,788; *Tilghman v. Proctor*, 102 U. S. 707, 722, 724, 725; *Fermentation Co. v. Maus*, 122 U. S. 413, 427, 428." (126 U. S. 533)

5. The Art of Making Pulleys.

Risdon Iron and Locomotive Works v. Medart
158 U. S. 68 (1895)

Philip and William Medart sued the Risdon Company for infringement of three of their patents on pulleys. In accordance with Medart's alleged invention, the pulley center was precisely centered, the ends of the spokes were ground concentrically with the axis, the face of the rim was ground concentric with the axis, and the edges of the rim were ground to square them. As a result, the pulley was more balanced, faultless in shape, stronger and more

durable. While recognizing these desirable characteristics, the opinion of Mr. Justice Brown clearly states that they did not result from a new discovery of the patentee but rather were the result of superior workmanship (158 U. S. 79). Accordingly, the Court found all three Medart patents to be invalid.

In reaching this conclusion, the opinion discusses in length the unpatentability of processes which are "the mere function of a machine." The question of the patentability of processes which are "the inherent function of a machine" has been repeatedly argued ever since.[1] At that time, the opinion in *Risdon* cast doubt on the patentability of all processes performed by machines. This doubt was resolved in favor of patentability by later decisions of this Court.

This is thoroughly discussed in Whitney, "Patentable Processes", 19 Harv. L. Rev. 30 (1906). Mr. Whitney's interpretation of *Cochrane v. Deener*, 94 U. S. 780 (1876) concludes that a process is not to be limited to a series of acts upon a material to be transformed and reduced to a different state or thing.

Then Mr. Whitney discusses the period of time following *Risdon Locomotive Works v. Medart*, during which early mechanical processes were considered unpatentable. He observed, pages 34, 35:

> "More concretely, the function of every machine is to perform some definite process—some act, or series of acts—upon a material object, by which it is transformed into a different state or thing. It follows that this process is not simply the function of the machine.

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1. The C. C. P. A. recently overruled several of its own prior decisions affirming rejections of claims as being the inherent functions of the machine. *Application of Tarczy-Hornoch*, 397 F. 2d 856 (C. C. P. A. 1968). This rejection is not presented in this case.

The two are entirely distinct entities. The one, as stated by Mr. Justice Bradley in the Tilghman Case, 'is a conception of the mind, seen only by its effects when being executed or performed.' The other is the production of those physical effects upon a material object."

Mr. Whitney was well grounded in the process by which inventions come into being. He observed, pages 35, 36:

"In the natural course of development, many processes of manufacture are first performed by hand, then partly by machinery and partly by hand, and, finally, automatically, by a machine. For others, machines have not yet been devised; and such processes must be performed wholly or in part by hand. Still other processes are beyond the power or skill of the hand, and must be performed, if at all, by a machine. But, however carried into effect, the process is still a process; and it matters not whether it was first practiced by hand, or was discovered and reduced to practice only in connection with the development of a machine. It does not cease to be such because it is, or must be, performed by mechanical means."

The paper concludes with a penetrating analysis as applicable today as it was in 1906:

"The patentability of a new process should, under our laws, be determined solely by ascertaining whether such process, as distinguished from the means by which it is to be performed, is new and useful, and amounts to an invention or discovery. If it meets this test successfully, the process fulfills every requirement, and is the proper subject of a patent."

This Court's decision in *Expanded Metal Company v. Bradford*, 214 U. S. 366 (1909) seems thoroughly to have adopted Mr. Whitney's analysis.

6. The Art of Expanding Sheet Metal.

Expanded Metal Company v. Bradford
214 U. S. 366 (1909)

In this case the Supreme Court had again under consideration the nature and character of method and process claims. Expanded sheet metal was old, but the patentee, Golding, had come up with a new way of making expanded metal. He devised a method by means of which the metal could be simultaneously cut and expanded.

This Court laid to rest any doubt as to the patentability of mechanical processes by its conclusion:

> "We therefore reach the conclusion that an invention or discovery of a process or method involving mechanical operations, and producing a new and useful result, may be within the protection of the Federal statute, and entitle the inventor to a patent for his discovery." (214 U. S. 385, 386)

The quotation from the opinion of Mr. Justice Waite is particularly relevant here:

> "It is lastly contended, and this is perhaps the most important question in the case, that in view of the former declarations and opinions of this court, what is termed a process patent relates only to such as are produced by chemical action, or by the operation or application of some similar elemental action, and that such processes do not include methods or means which are affected by mere mechanical combinations, and a part of the language used in *Corning v. Burden*, 15

How. 252, and *Risdon Locomotive Works v. Medart*, 158 U. S. 68, is seized upon in support of this contention. We have no disposition to question the decision in those cases." (214 U. S. 381, 382)

After discussing *Tilghman v. Proctor* noted above, Mr. Justice Waite, said:

"That this court did not intend to limit process patents to those showing chemical action or similar elemental changes is shown by subsequent cases in this court." (214 U. S. 384)

Mr. Justice Waite then quoted from the opinion in *Westinghouse v. Boyden Power Brake Company*, 170 U. S. 537 (1898), as follows:

"These cases [158 U. S. 68, and 103 U. S. 461] assume, although they do not expressly decide, that a process to be patentable must involve a chemical or other similar elemental action, and it may be still regarded as an open question whether the patentability of processes extends beyond this class of inventions." (214 U. S. 384)

He added these significant words:

"Where the process is simply the function or operative effect of a machine, the above cases are conclusive against its patentability; but where it is one which, though ordinarily and most successfully performed by machinery, may also be performed by simple manipulation, such, for instance, as the folding of paper in a peculiar way for the manufacture of paper bags, or a new method of weaving a hammock, there are cases to the effect that such a process is patentable, though none of the powers of nature be invoked to aid in producing

the result. *Eastern Paper Bag Co. v. Standard Paper Bag Co.*, 30 Fed. Rep. 63; *Union Paper Bag Machine Co. v. Waterbury*, 39 Fed. Rep. 389; *Travers v. Am. Cordage Co.*, 64 Fed. Rep. 771." (214 U. S. 384, 385)

It is not the hammock or paper bag that is patented, it is the process producing them.

7. The Art of Hatching Eggs.

Waxham v. Smith
294 U. S. 20 (1935)

The Supreme Court, speaking through Mr. Justice Stone, referred with approval to the Expanded Metal case and said:

"By the use of materials in a particular manner he secured the performance of the function by a means which had never occurred in nature, and had not been anticipated by the prior art; this is a patentable method or process. *Corning v. Burden*, 15 How. 252, 267, 268; *Risdon Iron & Locomotive Works v. Medart, supra*, 77; *Cochrane v. Deener*, 94 U. S. 780, 788. A method, which may be patented irrespective of the particular form of the mechanism which may be availed of for carrying it into operation, is not to be rejected as 'functional,' merely because the specifications show a machine capable of using it. *Expanded Metal Co. v. Bradford*, 214 U. S. 366, 382-386; *Cochrane v. Deener, supra*, 787, 788; cf. *Holland Furniture Co. v. Perkins Glue Co.*, 277 U. S. 245, 255, 256." (294 U. S. 22)

V.

PROGRAM CONTROL OF MACHINES IS A TECHNOLOGY WHICH IS PATENTABLE UNDER THE LAW DEVELOPED BY THIS COURT.

1. The Analog System.

Program control is as old as automatic machines. Examples abound everywhere. The housewife sets the temperature for the oven and the heating elements under programmed control maintain the selected temperature. If the heating is to be terminated after a lapse of time, time-control is included in the program. Elevators proceed to a selected floor, the doors are opened, closed, and returned to another selected floor under automatic control of a program. Automation has been the hallmark of production in this country. In such control systems, and in many computing systems of the analog type, use is made of generated physical quantities such as shaft rotations, electrical voltages, and cam-operated switches. Systems of the foregoing type have from the beginning of the patent system been patentable. Multiplication, division, subtraction and integration are common operations in systems of the foregoing kind.[2]

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2. In an early decision, the First Circuit Court of Appeals had before it a patent for a computing machine. The patent related to additive subtraction, a technique by which adding machines may be utilized to perform problems of subtraction. As the Court described additive subtraction, it consisted of two distinct operations:

"First, the operation of finding the complement of the subtrahend by subtracting it from a higher power of 10; and, second, the adding of this complement to the minuend. The only part of additive subtraction which can be performed mechanically upon an adding machine is the second step in the process, which is merely an ordinary sum in addition. The performance of this second step results in the error of .1 on the reading line of the machine, and the whole scope and purpose of the Felt in-

2. The Digital System.

The digital system uses discrete quantities instead of the continuous quantities used in analog computers. These quantities are usually in the binary system, with one digit represented by the "On" state of an electronic device and the other by the "Off" state. The numbers or words utilized in digital systems can extend to any desired significant figure for any desired degree of accuracy. They can reproduce rapidly varying quantities whether mechanical, electrical, or chemical in character. The usefulness of the digital computer is only limited by economic considerations since a large-scale digital computer can accomplish all of the operational functions of an analog system.

A *special purpose digital* computer is one which has a single mode of operation and is dedicated to a single application.[3]

General purpose computers use a stored program which is easily changed for different applications. General purpose digital computers have been properly characterized as "merely a 'warehouse of unrelated parts' ". It was so described by the Commissioner of Patents in his Guidelines of August 2, 1966, 829 Official Gazette 1. There the Commissioner said:

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2. (Cont'd.)

vention is to prevent mechanically the occurrence of this error." (145 Fed. 335)

The Court then proceeded to examine the patent and the prior art and found that the claims were directed to a new and unobvious invention and held them valid and infringed. *Comptograph Co. v. Mechanical Accountant Co.*, 145 Fed. 331 (1st Cir. 1906).

3. The first electronic digital computer was a special purpose machine for computing gun fire tables. It was developed in 1946 at the University of Pennsylvania and was known as ENIAC. It used a program in the form of a wire patch board in which the wires had to be physically changed each time the program was changed (see *Sperry Rand Corporation v. Bell Telephone Laboratories, Incorporated*, 208 F. Sup. 598 (S. D. N. Y. 1962) appeal dismissed, 317 F. 2d 491 (2nd Cir. 1963); the ENIAC patent is No. 3,120,606).

"A programable machine, such as a general purpose computer, with its various parts not interconnected to perform any useful combined operation is merely a 'warehouse' of unrelated parts. It may well be that the same machine, with a program device correctly related thereto, may yield a novel and useful machine combination due to the new interrelation of parts. In other words, the fact that such a prior art machine can have its parts interrelated by a program device in a new way to carry out machine functions of a specialized character may well result in a new patentable combination, unless there is a prior art teaching that would make the interrelations and results thereof obvious."

Similarly, new methods of operation performed by the machine with the new program may be patentable. The amici curiae in support of the Petitioner seem to argue that this case involves the patentability of computer programs *per se*. It does not. Benson and Tabbot claim the new method performed by a general purpose computer with their program.

The general purpose computer plus its program is the most versatile machine yet invented. With each different program it is converted into a new and different machine in terms of the operations performed and the results achieved. Whether a new operation of the machine is patentable depends upon whether the new operation, alone or as part of an overall system, is unobvious and represents an advance in the useful arts in which it is utilized.[4]

4. For an example in which a new operation is programmed in an automatic control sytem including a computer, see U. S. patent 3,339,457, Pun. The first page is reproduced as Appendix I. This patent was selected as an example by the Commissioner of Patents to illustrate a new format for the first page of patents, as announced in 877 O. G. 1. The Pun patent describes the operation of a program-controlled computer which in turn controls the aiming of a gun.

The question of the patentability of a program *per se* is not involved in this case. Neither is the question of whether an equation *per se* is patentable, nor whether a principle of nature is patentable. Such questions were not before the Court of Customs and Patent Appeals preceding and following its decision in the instant case. As will now be demonstrated that Court scrupulously applied the case law as annunciated by this Court in the decisions referred to above.

VI.

THE COURT BELOW FOLLOWED THE LAW DEVELOPED BY THIS COURT IN THE PRATER AND WEI DECISIONS.

Application of Prater, 415 F. 2d 1378 (C. C. P. A. 1968) and Application of Prater, 415 F. 2d 1393 (C. C. P. A. 1969)

In the decision on the application of Prater and Wei, and in many of the subsequent cases, the court below considered Patent Office rejections based upon 35 U. S. C. §§ 100, 101, 102, 103 and 112. Thus there were rejections based upon anticipation, obviousness, and statutory subject matter, as well as whether or not the claims met the requirements of section 112 in particularly pointing out and distinctly claiming the invention. In the case now before this Court a rejection based solely on 35 U. S. C. § 101 is under consideration.

1. The Art of Spectrographic Analysis.

Prater and Wei discovered how to achieve a spectrographic analysis of a mixture of gases to determine with increased accuracy of measurement the concentration of

each gas in a mixture. Their discovery was the relationship between error magnification and the size of the determinant of each subset of a plurality of sets of simultaneous equations. Their invention resided in an analog system or a properly programmed digital computer which would not only make the search for the set of equations to be utilized, but also determine the concentration of each of the constituents in the gaseous mixture. Their claims were directed to the manner of making use of the discovery by a new and different operation of a computer, whether analog or digital.

2. The First Prater and Wei Decision of November 20, 1968, 415 F. 2d 1378.

The arguments in this case were heard by Chief Judge Worley, Associate Judges Rich, Smith and Almond and Senior District Judge Kirkpatrick from the Eastern District of Pennsylvania.

Recognizing the importance of the issues involved, the court, Opinion by Judge Smith, not only considered the reasoning of the Board of Appeals but reviewed in depth the several arguments on which the Examiner based his rejection of all of the Prater and Wei claims. The Examiner recognized that Prater and Wei were entitled to patent coverage on their analog embodiment of their system. However, the Examiner argued that if the claims would embrace a properly programmed general purpose digital computer, then Prater and Wei would not be entitled to such claims notwithstanding the fact that they had disclosed that for certain applications the use of the ditigtal computer would be indicated. (For complicated problems, Prater and Wei disclosed that the general purpose digital computer would be preferred over the analog computer.)

The Patent Office argued that the principal question presented to the court for decision was whether claims

could be interpreted to read on a mental process. If so, they would be unpatentable as falling outside the statutory classes of Sections 100 and 101. To support this position there was reliance upon the case of *In re Abrams*, 188 F. 2d 165 (C. C. P. A. 1951). The court thoroughly studied the *Abrams* case as well as the case of *In re Shao Wen Yuan*, 188 F. 2d 377 (C. C. P. A. 1951). The decision presents reproductions of the drawings from the *Abrams* case together with a discussion of the issues involved. The court properly concluded that in *Abrams* the disclosure was mental in character. No automatic system was disclosed. It was necessary for the operator to utilize the procedures disclosed by Abrams and to think about the various steps and to interpret the results of each step in order to proceed with the next one. The same conclusions were drawn in respect of the decisions in *Halliburton Oil Well Cementing Co. v. Walker*, 146 F. 2d 817 (9th Cir. 1944) and *Don Lee Inc. v. Walker*, 61 F. 2d 58 (9th Cir. 1932).

As part of the thorough consideration of the questions involved, Judge Smith in his Opinion beginning page 1387 reviewed the development of the patent law from its constitutional origin and in particular the import of the decision of this Court in *Cochrane v. Deener*, 94 U. S. 780 (1876). The conclusion was properly reached that this Court in *Cochrane v. Deener* did not set up limits in respect of process patentability but intended and explicitly said:

> "That a process may be patentable irrespective of the particular form of the instrumentalities used,". (94 U. S. 787)

The intended breadth of 35 U. S. C. § 101 was made evident by Judge Smith's reference to two cases, *Smith v. Snow*, 294 U. S. 1 (1934) and *Waxham v. Smith*, 294 U. S. 20 (1935). In these cases, this court indicated that the

process met the requirements of patentability because the performance of a function which had never occurred in nature, which had not been anticipated by the prior art, was attained.

The court in *Prater and Wei* then concluded:

> "This distinction from Abrams (that his process could only be performed in the mind as far as the disclosure was concerned) leads us to our present holding which is that patent protection for a process disclosed as being a sequence or combination of steps, capable of performance without human intervention and directed to an industrial technology—'useful art' within the intendment of the constitution—is not precluded by the mere fact that the process could alternatively be carried out by mental steps." (415 F. 2d 1389)

Thus the rejection of the process claims was reversed. Following a brief discussion of the apparatus claim, its rejection was also reversed.

3. The Decision in Prater and Wei of August 14, 1969, 415 F. 2d 1393, After Rehearing.

After grant of the petition by the Patent Office for rehearing, the court granted permission for amici curiae to file briefs and to participate in the oral argument. Briefs were presented by Bell Telephone Laboratories, International Business Machines Corporation (IBM), Honeywell,, Inc., Applied Data Research Inc., and the Association of Independent Software Companies (Software Association).

The court comprised Chief Judge Worley, Judge Maguire, Senior District Judge, District of Columbia and Associate Judges Rich, Almond and Baldwin. The Opinion was by Judge Baldwin.

The court again found that the fact situation presented was not controlled by *Abrams, Yuan,* or *Cochrane v. Deener.* Besides adopting Judge Smith's more detailed analysis of the *Abrams* case, the Opinion again reviewed that case together with *Yuan* and *Cochrane v. Deener.*

The key to the decision on Rehearing lies in the finding of the court, page 1403:

> "that there is no dispute, as between the principal parties, that appellants have *disclosed* a patentable statutory process." (Emphasis by Court.)

The opinion by Judge Baldwin then points out that there remains a question of whether Prater and Wei were entitled to a claim broad enough to cover a mental process coupled only with pencil and paper markings as well as the operation of a properly programmed general purpose digital computer and the operation of an analog device.

The Court held to be fatal the attorney's admission that claim 9 could, absent the specification, be read on a "pencil and paper execution". Since claim 9 was thus found to read on subject matter for which Prater and Wei did not seek coverage, this admission was held to run afoul of Section 112. Accordingly there was affirmance by the court of the Patent Office rejection of all of the method claims as not meeting the requirements of Section 112.

Apparatus claim 10 however fell into an entirely different category. For an apparatus claim, any "mental steps" issue is absent. Claim 10 was a typical means-plus-function claim expressly permitted by the third paragraph of 35 U. S. C. § 112. The C. C. P. A. reversed the Patent Office rejection of this claim.

VII.

THE LATER DECISIONS OF THE COURT OF CUSTOMS AND PATENT APPEALS FOLLOWED THE LAW DEVELOPED BY THIS COURT TO ACCOMMODATE OTHER NEW TECHNOLOGIES.

1. The Art of Producing Isometric Drawings.

Application of Bernhart
417 F. 2d 1395 (C. C. P. A. 1969)

This case related to the applicability of a general purpose computer in producing isometric drawings by a plotter under the control of a general purpose computer. The ability of the Patent Office to search such subject matter is evident from its citation of the relevant prior art. The recognition by the court of that prior art as anticipatory is evidenced by its affirmance of the rejection of claims 13 and 18. The court reversed the Patent Office in respect of claims 19-21 because the prior art was not anticipatory and the claims met the test of statutory subject matter.

The reasoning of the court as set forth in the opinion by Judge Lane includes the adoption of the Commissioner's position of 1966, *supra*, by pointing out that if the machine:

> "is programmed in a certain new and unobvious way, it is physically different from the machine without that program; its memory elements are differently arranged. The fact that these physical changes are invisible to the eye should not tempt us to conclude that the machine has not been changed. If a new machine has not been invented, certainly a 'new and useful improvement' of the unprogrammed machine has been, and Congress has said in 35 U. S. C. § 101 that such improvements are statutory subject matter for a patent." (417 F. 2d 1400)

The Court then observed that the vast majority of newly programmed machines might well be held to be obvious to those skilled in the art and hence unpatentable under 35 U. S. C. § 103. With this statement we agree since in each case involving the new operation of a computer, the statutory requirements must be met in respect of novelty and unobviousness.

That the C. C. P. A. rigidly followed not only earlier decisions of this Court, but the intent of Congress is clear from the following statement:

> "We think it is clear that in enacting section 101 Congress meant to exclude principles or laws of nature and mathematics, of which equations are an example, from even temporary monopolization by patent. Accordingly, no rule of law should be announced which would impress a monopoly upon all uses of the equations disclosed by appellants here in their patent application. To allow the claims in issue here would not prohibit all uses of those equations. As we have pointed out above, a member of the public would have to do much more than use the equations to infringe any of these claims. He would have to use them in the physical equipment recited in the claim. Moreover, all machines function according to laws of physics which can be mathematically set forth if known." (417 F. 2d 1399)

The Court concluded that the claimed apparatus was statutory subject matter and some of the claims were patentable over the prior art.[5]

5. It is worth pointing out that IBM had filed an application on similar subject matter prior to the decision in the *Prater and Wei* case. IBM in its Lourie patent 3,529,298 had sought and received claims from the Patent Office of the same type it here contends should be denied to others. We need to cite but one example together with the observation that the graphical design produced bears some resemblance at least to the subjects matter involved in the

2. The Art of Digital Data Communications.

Application of Mahony
421 F. 2d 742 (C. C. P. A. 1970)

In the transmission of a sequence of electrical signals representing a stream of data bits, it is necessary to have synchronization between the sending and receiving terminals. This synchronization, or framing, allows proper identification of the individual words in the stream. This is done by inserting so-called framing bits into the data stream. The identification of these framing bits represented the subject matter on appeal. The decision and Opinion by Judge Lane represents an important clarification in the development of the law.

The principal question decided by the court was whether the appealed claims covered a machine implementation of the process and not mental steps. The court

---

5. (Cont'd.)
Bernhart and Fetter appeal. A portion of a selected method claim follows:

> 18. A method of graphically developing a textile weave design from an outline design displayed upon an assumed coordinate grid by operating a data processing system having data storage means and graphic data display means to display arbitrary weave patterns within arbitrarily bounded areas of said outline design, said method comprising the steps of:
>
> operating a portion of said storage means as a weave memory (WM) for assembling stored bits in coordinate arrays representing a plurality of available weave patterns, each having a distinctive arrangement of warp and weft thread crossings; . . . .
>
> operating said display means in accordance with the data stored respectively in said pattern store and said area data table to display in at least some of the rows of said coordinate grid, but only in the positions thereof located within the selected area or areas of said design, graphic symbols representing the thread crossings of each selected weave pattern, excluding from such display any bits of the selected pattern whose symbols would lie outside of the area or areas designated to receive that pattern.

was concerned with the breadth of the claims and used the claims themselves as the yardstick in determining compliance with the Patent Act by asking what they mean to one skilled in the art to which the invention pertains. If they define a machine process in contrast with a mental process, they are statutory.

The court pointed out that the invention could be illustrated by pencil and paper representation, as a method can sometimes be better understood by using an equation interrelating various factors to be utilized in reaching a solution.[6] Nevertheless when the claims call for a "bit stream", recognized dictionaries, such as the Computer Dictionary and Handbook (1966) by Charles J. Sippl, make clear that those skilled in the art use the term bit stream

> ". . . in conjunction with transmission methods in which character separation is accomplished by the terminal equipment, and the bits are transmitted over the circuit in a consecutive line of bits." (421 F. 2d (746)

The Court concluded that in acting on the bits in a bit stream, physical phenomena has been set forth the same as in electrical circuitry where sinusoidal electrical signals are involved.

While one may draw a sine wave representative of such electrical signals, when signals of sine wave form are called for they are again physical in character. Thus it is customary in the electrical arts with reference to electrical signals to talk about chopping, rectifying, filtering

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6. The Court so held in *MacKay Radio and Telegraph Company v. Radio Corporation of America*, 306 U. S. 86, 100 (1939) where this Court found no problem in the use of a formula in defining Carter's radio antenna. The basis for invalidity was Carter's effort during prosecution of the application to modify and broaden the formula to a point where it involved new matter.

and so on. So it is in the computer art. Bit streams and bits, and the manner in which they are operated upon, are just as physical in nature as sinusoidal electrical current which operates electrical motors for the well-being of society.

The court distinguished the *Mahony* case from *Prater and Wei* in that Prater and Wei were seeking to cover only machine executed methods but their method claims were broader than their invention—hence overclaiming.

From the foregoing it will be seen that the court did not open widely the door to the granting of patents. When the court below has been presented with a rejection under Section 112 of the Patent Act, it insisted that each applicant fully comply with the requirements of this section.

3. The Art of Tracking Vehicles.

Application of Hammack, 427 F. 2d 1378 and Application of Hammack, 427 F. 2d 1384 (C. C. P. A. 1970)

The two Hammack applications described the determination of the position and velocity of moving objects, such as aircraft, space vehicles, ballistic missiles, and submarines.

The decisions of July 2, 1970 affirmed the rejection by the Patent Office of all claims on appeal because of indefiniteness and failing to meet the statutory requirements of Section 112.

4. The Art of Seismic Exploration.

Application of Musgrave
431 F. 2d 882 (C. C. P. A. 1970)

The *Musgrave* case may be considered to be a companion case of *Prater and Wei* (both assigned to Mobil Oil Corporation) in that both disclose analog systems for

the practice of the method and for support of broad apparatus claims. The *Musgrave* case dealt with seismic operations and in particular how to obtain better and more useful information about the nature and character of subsurface formations in locating oil fields.

An earlier case, *Application of Naquin*, 398 F. 2d 863 (C. C. P. A. 1968), dealt with the same subject matter. In the *Naquin* case, the Patent Office rejected the claims only on the basis of lack of a complete disclosure meeting the requirements of the first paragraph of Section 112. The computer program had not been disclosed. The court reversed the Patent Office on the basis that the Examiner himself had agreed that the principles of how to program a computer to perform the steps were well known to those skilled in the computer art. It was only necessary to have a flow diagram explaining the particular advance in the art made by Naquin. A complete computer program was not necessary to complete the disclosure since such programming would be well within the skill of the art to produce.

In contrast with Naquin, Musgrave disclosed a fully operative analog system but like Prater and Wei mentioned that one way of carrying out the invention would be to utilize a general purpose computer in place of the analog system. This statement that the process could be carried out by the general purpose computer formed the real basis of rejection by the Patent Office.

The court concluded that the process as a whole, as defined by the claims, did indeed represent subject matter within Section 101. The claims were all to a sequence of steps comprising a process under Section 101. The invention clearly was in the technological arts and thus consonant with the Constitutional purpose to promote the progress of "useful arts".

5. More Seismic Prospecting Art.

Application of Foster
438 F. 2d 1011 (C. C. P. A. 1971)

This application (also assigned to Mobil Oil Corporation) described methods of processing geophysical data to eliminate distortion present in seismograms.

Judge Almond in his Opinion cautioned that one must draft claims which meet the requirements of 35 U. S. C. § 112 in that they must set forth only the machine implemented processes which applicant regards as his invention. When they go beyond this point, the Patent Office correctly rejects them (438 F. 2d 1015). Because of this, the court affirmed the Patent Office as to claims 4, 7-13, and 15-18 but reversed as to claims 1-3, 19, 20, 26 and 27. These latter claims met the requirements both of 35 U. S. C. § 101 and of 35 U. S. C. § 112. Specifically, the court found that the use merely of the word "signals" does not limit the claim to machine implemented processes. A statement that they are "electrical signals", or other language of the art as in Mahony, must be present to make the claims commensurate with the applicants' own definition of what they were seeking to cover. When the claims go beyond that, i.e., overclaiming, the Patent Office position will be affirmed.

6. The Art of Operating Computers.

Application of Ghiron
442 F. 2d 985 (C. C. P. A. 1971)

Ghiron and Ulrich were seeking claims on a method of facilitating transfers dictated by programs for processing data in a computer operating in overlap mode.

The court, Opinion by Judge Baldwin, followed the earlier decisions in respect of insufficiency of disclosure (442 F. 2d 991). Again, the court makes self-evident the

care with which it approaches the problem of patentability in this new and exciting field of endeavor. Apart from the prior art rejection which was reversed, the court found great merit to the position of the Patent Office on the inadequacy of the disclosure as to how one would use a special purpose computer to practice the invention.

7. More Computer Operating Art.

Application of McIlroy
442 F. 2d 1397 (C. C. P. A. 1971)

In the *McIlroy* case, the Patent Office rejection of the claims as drawn to non-statutory subject matter under 35 U. S. C. § 101 was reversed.

The court found that where a process has practical value in enhancing the internal operation of digital computers, the improvement is in the field of technological or useful arts and hence statutory.

8. The Art of Analyzing Data In Computer-Controlled Systems.

Application of Waldbaum
173 U. S. P. Q. 430
(No. 8619, C. C. P. A. April 20, 1972)

This is the last C. C. P. A. decision on programming technology decided at the time of writing this brief.

The C. C. P. A. reversed the Patent Office rejection under 35 U. S. C. § 101.

The opinion is significant for its further clarification of the phrase "technological arts" as used in *Benson and Tabbot* here on appeal and as originally used by the C. C. P. A. in *Musgrave*. The *Waldbaum* opinion makes clear that "technological arts" as used by the C. C. P. A. is synonomous with the phrase "useful arts" as it appears in

the patent clause of the Constitution. This considerably clarifies the issue on appeal here. Is the Benson and Tabbot BCD to binary conversion technique a "technological" or "useful art"? If it is, it meets the constitutional requirement which is all that the statutory language of 35 U. S. C. § 101 is intended to convey.

9. Summary of Section VII of This Brief.

The above decisions are to be contrasted with the positions urged by Petitioner and amicus I. B. M. that the Court of Customs and Patent Appeals, in the aforesaid decisions, has in effect directed the Patent Office to grant patents on scientific principles, mental processes and abstract intellectual concepts. That court has not taken such a position but rather has closely adhered to the standards set forth by this Court.

As shedding further light on the performance of the court below, reference may be had to Appendix II, a comparative table of claims rejected and claims allowed in the several cases before the court involving broadly the technology of program control. The care with which the C. C. P. A. has scrutinized the rejections of the claims presented to it on appeal is well demonstrated by the table.[7]

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7. The Table shows that the Patent Office had allowed the various applicants thirty-nine claims before the cases were appealed to the C. C. P. A. on other claims. In these appeals the C. C. P. A. affirmed the Patent Office on the rejection of one hundred nine claims, of which a disproportionately large number, sixty-four, were in one *Application of Hammack*, 427 F. 2d 1384 (C. C. P. A. 1970). The C. C. P. A. reversed the Patent Office on the rejection of one hundred claims, of which a disproportionately large number, fifty, were in one *Application of Musgrave*, 431 F. 2d 882 (C. C. P. A. 1970).

VIII.

THE ART OF CONVERTING SIGNALS IN BINARY CODED DECIMAL NOTATION INTO ORDINARY BINARY NOTATION.

Application of Benson
441 F. 2d 682 (C. C. P. A. 1971)

The opinion by Judge Rich gives considerable attention to the ground of rejection before the court. The conclusion was that the only ground of rejection relied upon up to the time of the appeal was 35 U. S. C. § 101 (441 F. 2d 684).

Our comments here are limited to a few points which may aid the Court in a better understanding of the subject matter and the limited nature of the decision by the court below.

The conversion of binary coded decimal signals into signals of binary notation is a simple operation. Nevertheless an understanding of what these terms mean and how the conversion is accomplished requires a bit of study. To make this task easier, we include in Appendix V a step-by-step explanation which we hope will prove useful to the Court. The most pertinent prior art referred to in Appendix V was found by the Patent Office. It formed the basis of the rejection of many claims and resulted in cancellation of some claims from the application. Only two claims remain before the Court.

The Commissioner of Patents argues that claim 8 applies to a series of mathematical calculations or mental steps. However, as we read the claim, it is strictly limited to the control of a reentrant shift register in a computer in a manner undisclosed by the prior art to solve a particular problem. There is no possibility of interpreting claim 8 to cover a new mathematical procedure absent the assumed novel operation of a shift register.

There was no rejection by the Patent Office under 35 U. S. C. § 112. The court below found that the rejection of both claims was based solely upon 35 U. S. C. §§ 100, 101. The court found that claim 8 met the requirements of these sections since the claim calls for a method or process performed on the machine disclosed in the patent application, namely a reentrant shift register.

Claim 13 falls within a different category. It was found to be broad enough to cover the machine implementation disclosed in the application, still another machine implementation disclosed during prosecution, and a third manual execution. Because the manual practice would be improbable and lacking in any utility, the court decided that it should realistically be interpreted to cover only the operation and utilization of a machine such as a digital computer, a machine clearly in the technological field and within the definition of "useful arts" rather than the "liberal arts".

The Court, in finding claim 13 directed to statutory subject matter applied a "standard of reasonableness" in claim construction. That standard was laid down by this Court in *United States v. Adams*, 383 U. S. 39 (1966). In the *Adams* case, as here, the Government in its analysis of the claims attempted to ignore the technology and the teaching of the specification. This Court stated:

> "There are several basic errors in the Government's position. First, the fact that the Adams battery is water-activated sets his device apart from the prior art. It is true that Claims 1 and 10, supra, do not mention a water electrolyte, but, as we have noted, a stated object of the invention was to provide a battery rendered serviceable by the mere addition of water. While the claims of a patent limit the invention, and specifications cannot be utilized to expand the patent monopoly, Burns v. Meyer, 100 U. S. 671, 672, 25

L. Ed. 733 (1880); McCarty v. Lehigh Valley R. Co., 160 U. S. 110, 116, 16 S. Ct. 240, 242, 40 L. Ed. 358 (1895), it is fundamental that claims are to be construed in the light of the specifications and both are to be read with a view to ascertaining the invention, Seymour v. Osborne, 11 Wall. 516, 547, 20 L. Ed. 33 (1871); Schriber-Schroth Co. v. Cleveland Trust Co., 311 U. S. 211, 312 U. S. 654, 61 S. Ct. 235, 85 L. Ed. 132 (1940); Schering Corp. v. Gilbert, 2 Cir., 153 F. 2d 428 (1946)." (383 U. S. 48, 49)

In interpreting claim 13, the C. C. P. A. properly concluded that it is not directed to mental activity, abstract concepts, scientific principles, or to an equation *per se* either new or old.

We do not suggest to this Court that an equation *per se*, a program *per se*, a schematic diagram *per se*, or pencil and paper computations are patentable. Where new and unobvious operations are performed on a machine and where the operation of the machine itself is vastly improved by reason of a new and unobvious program, the court below has found patentable subject matter. Accordingly, we submit that the court below has properly accommodated the patent law to the field of computer technology. Its holding of patentability should be sustained.

IX.

THE TACIT APPROVAL BY THE PATENT OFFICE OF THE EARLIER DECISIONS, DISCUSSED ABOVE.

Following the decision of *Prater and Wei* upon Rehearing, the Commissioner of Patents announced[8] that the Patent Office would follow that decision on a case-by-case basis. Though arguments continued to be presented

8. The "Notice of Recission of Guidelines" appeared in 34 F. R. 15724 October 10, 1969.

to the court below in cases where issue had been joined, no petition for certiorari was filed. On the contrary, the Patent Office followed the law of *Prater and Wei*. The *Prater and Wei* patent was duly issued, Appendix III, as was the patent in the *Application of Wheeling*, 413 F. 2d 1187 (C. C. P. A. 1969). (Mobil also owns the Wheeling patent and a representative claim is reproduced in Appendix IV.)

Those active in this field continued to believe the Patent Office had adopted the *Prater and Wei* decision. It was not until the decision in the *Application of Benson* that a petition for certiorari was filed. Amicus strenuously urges that the carefully reasoned decisions of the C. C. P. A. preceding the instant case be left undisturbed. These decisions provide a workable body of law which can be used to determine patentability in this new technology. If this line of decisions is now renounced, the resulting uncertainty will deter, rather than promote, the progress of this useful art.

X.

THIS TECHNOLOGY IS ACCORDED PATENT PROTECTION IN FOREIGN JURISDICTIONS.

Though the patent laws of other countries may differ from our own, and hence decisions of foreign courts on the questions of law presented by the instant case may not be directly relevant, this section of the brief is included because the Brief for Amicus Curiae International Business Machines Corporation asserts that the practice in other countries is to deny patent protection for this subject matter.[9] That this is not so is demonstrated by decisions in the following countries.

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9. Brief for Amicus Curiae International Business Machines Corporation, p. 26.

Great Britain.

In the technological field of computer operations, several cases have been decided in favor of patentability. In two cases the question was carefully considered by the Patent Appeal Tribunal which is presided over by a Judge of the High Court of England.[10] In *Gevers' Application* the invention was a data processing apparatus constructed and arranged with appropriate mechanographic supports so that three steps could be carried out by the machine. The three steps recited in the claims were:

> 1. Entering a succession of words into a computer or other data processing apparatus programmed to translate the words into other words in accordance with a specific rule and to record the translated words on cards or tape;
>
> 2. To sort the cards or words on the tape into lists in one of three enumerated ways;
>
> 3. To print out the list with the words in the original form.

The question presented for review by the Patent Appeal Tribunal was whether there was an invention which fell within Section 101 of the British Patents Act of 1949. Concerning the subject matter defined by the claim, Graham, J. stated:

> "In other words . . . it is fair to say that the claim calls for apparatus which is programmed in a certain way so as to produce the desired result." (page 95)

The Examiner in the Patent Office had rejected Gevers' Application on the basis that "this alleged inven-

10. Badger Company, Incorporated's Application [1970] Pat. Cas. 36 and Gevers' Application [1970] Pat. Cas. 91.

tion would seem to be a scheme or a plan which, although it may be ingenious and useful is not a patentable invention." On this point Mr. Justice Graham stated that what was claimed was a piece of machinery constrained to function a certain way and produce a certain desired result by reason of the program. This was deemed an invention within the meaning of the patent act.

Prior to *Gevers' Application* Mr. Justice Lloyd-Jacob in *Badger Company Incorporated's Application* considered whether an invention involving the use of a computer of known type conditioned to produce a drawing of a piping layout was within Section 101 of the British Patent Act. The finding was affirmative. The *Badger* case, involving as it did a program controlled plotting device, bears strong resemblence to the technology involved in the United States Court of Customs and Patent Appeals decision, *Application of Bernhart*, 417 F. 2d 1395 (C. C. P. A. 1969).

An earlier decision of the Superintending Examiner of the Patent Office in *Slee and Harris's Application*, [1966] Pat. Cas. 194 is in accord with the *Gevers'* and *Badger* cases. In this case, claims to linear programming means for use in controlling data processing apparatus were allowed on appeal.

Canada.

The most recent decision in any of the foreign patent tribunals is that of the decision of the Commissioner of the Canadian Patent Office on December 8, 1971: IN THE MATTER OF *a patent application serial number 961,392.*[11] In this decision, the Chairman of the Patent Appeal Board,

11. The official report is not yet published, but the entire text of the decision appears in 58 Patents, Trademark & Copyright Journal, D-1, December 23, 1971. The rejection of the corresponding application in the U. S. was recently reversed in *Application of Waldbaum*, 173 U. S. P. Q. 430 (No. 8619, C. C. P. A. April 20, 1972).

commenting on the status of the British Patent Office and Patent Appeals Tribunal decisions, said:

> ". . . it is clear to me that both bodies recognize that inventions involving the use of programmed computers are proper subject matter for patent protection. It is also clear to me that although some formalities may have to be observed in drafting claims, there is nothing in the Appeal Tribunal decisions to suggest that inventions involving programmed computers should not satisfy the usual tests of novelty, utility and inventive ingenuity." (page D-2)

The rejections of claims drawn to methods for controlling the operation of a computer, claims to a programmed machine, and claims to the new use of a stored program data processing apparatus were reversed. This decision superseded the previous administrative guidelines of the Canadian Patent Office. See the Canadian Patent Office Records, December 28, 1971, p. 8, which contains new guidelines consistent with the Canadian *Waldbaum* decision.

Federal Republic of Germany.

The use of program-controlled digital computers was considered by the German Federal Patent Court in reviewing an opposition proceeding involving an application of *Philips Electrologica GmbH*, Docket 17 W(pat) 6/68.[12] The opposition was brought by International Business Machines (IBM-Germany)—a subsidiary of Amicus International Business Machines—and a wholly German company—AEG, Telefunken. The invention was for a method of operating a program controlled computer. The introductory portion of claim 1 translates as:

12. The opinion has not yet been published.

"Method for automatically converting one unit of value into another, for example, a nondecimal unit of measurement into decimal within a specified range of tolerance for data processing machines characterized in that the unit of value introduced into a multiplying program controlled computer is, after multiplication by the specified conversion factor, advanced to a first memory store . . ."

The opponents argued that Philips' patent application was not proper subject matter for patent because the invention was a "directive for the intellectual powers" and involved "primarily a question of fixing a calculation method." They argued that the method of claim 1 cannot be classified into one of the known method categories. The German Federal Patent Court distinguished between an invention which may be unpatentable because it is obvious (lacking inventive height) and an invention which could not in the first instance be patentable because it is not proper subject matter for patent. The Court found lack of "inventive height". However, the Court rejected the opponents' contention that the invention was not a technology within the meaning of the patent law. A portion of the opinion translates as follows:

"Thus the subject of the invention satisfies the conditions set before, the subject of the invention is therefore in the field of technology in the sense of the patent system. The technical character of the specified solution is not refuted by the fact that the specified sequence of operations can be carried out without the use of machine parts (with 'pencil and paper')."

Other Countries.

The decisions discussed above in Germany, Canada and Great Britain are the most authoritative thus far on this question.

The three Australian decisions referred to in the brief of Amicus IBM are decisions of the Patent Office Superintending Examiner. These decisions were before the decisions in *Gevers* and *Badger* of the Appeal Tribunal of England. In view of the propensity of the Australian Patent Office to follow British precedents these Australian cases would seem to have questionable vitality. Also, the decisions of the Superintending Examiner appear to depart from the principle laid down by the High Court of Australia in *National Research Development Corporation's Application* [1961] Pat. Cas. 135. The following statement of the court is pertinent here:

> "The point is that a process, to fall within the limits of patentability which the context of the Statute of Monopolies has supplied, must be one that offers some advantage which is material, in the sense that the process belongs to a useful art as distinct from a fine art (see *Virginia-Carolina Chemical Corporation's Application* [1958] R. P. C. 35 at p. 36)—that its value to the country is in the field of economic endeavour." (page 145)

In its brief on Petition for Writ of Certiorari, Amicus IBM pleads that "great weight should be given to the practice in other countries". If this plea is to be honored, the foregoing decisions in favor of the patentability of this new technology should be the standard, and the holding of the court below should be affirmed.

XI.

CONCLUSION.

The legal conclusions of the court below are soundly reasoned and consistent with the Constitutional purpose to promote the progress of useful arts. The decision below should in all respects be affirmed.

Respectfully submitted,

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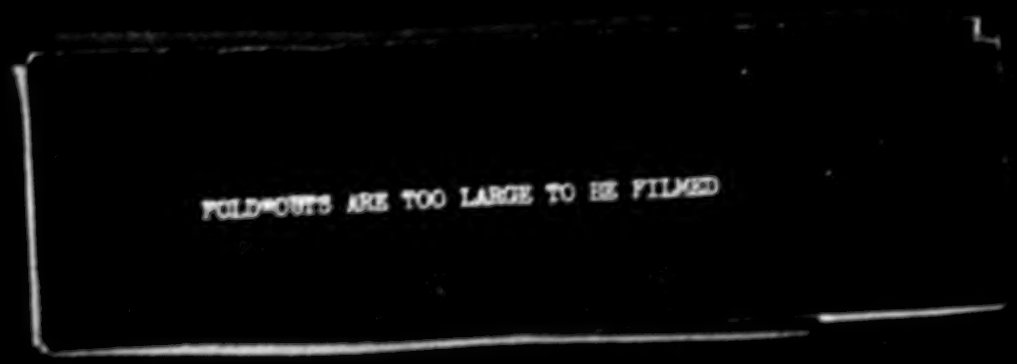
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APPENDIX II.

TABLE OF C .C. P. A. COMPUTER PROGRAMMING CASES COMPARING NUMBER OF CLAIMS UPON WHICH REJECTION WAS REVERSED WITH NUMBER ON WHICH REJECTION WAS AFFIRMED.

	No. of Claims Allowed Before Appeal to C.C.P.A.	*No. of Rejected Claims Upon Which the Rejection Was Affirmed by C.C.P.A.*	*No. of Rejected Claims Upon Which the Rejection Was Reversed by C.C.P.A.*
Prater & Wei (1)	0	0	12
Prater & Wei (2)	0	11	1
Wheeling	5	(Case remanded for determination of statutory basis of rejection of five rejected claims.)	
Bernhart & Fetter	0	3	3
Mahony	14	0	2
Hammack (1)	7	12	0
Hammack (2)	0	64	0
Musgrave	6	0	50
Foster et al.	0	12	7
Ghiron & Ulrich	5	7	0
Benson & Tabbot	0	0	2
McIlroy	2	0	8
Waldbaum	0	0	15
	39	109 (45 other than Hammack (2))	100 (50 other than Musgrave)

APPENDIX III.

UNITED STATES PATENT 3,551,658.
PRATER & WEI.

6. The method of determining with minimum error from the spectra of spectral analysis the concentration of the components of a mixture where the components are known and the concentration-determining peaks of the spectral analysis are present in number exceeding the number of said components, which comprises in an automatic processing system the steps of

generating physical representations in said system of the magnitudes of the coefficients of simultaneous linear equations defining the concentrations of said components as functions of the heights of said peaks of said spectral analysis,

generating in said system from said physical representations of the magnitudes of said coefficients the magnitude of the determinant of a plurality of sets of said simultaneous equations, the number of equations of each of said sets being equal in number to the number of said components,

in said system comparing said physical representations of the magnitudes of said determinants of said sets of equations for identification of the set of said equations whose determinant has the largest magnitude, and

generating physical representations of the concentration of each said component of said mixture from said physical representations of the magnitudes of said coefficients of said set of simultaneous equations having said determinant of largest magnitude and from said heights of said peaks included in said last-named set of equations.

APPENDIX IV.

UNITED STATES PATENT 3,564,221.
WHEELING.

4. In optimizing a scalar output function of a system where a set of input values to said system some of which are independently variable, are interrelated, and coact to produce said scalar output function, the method which comprises the following steps:

generating in the system input signals representative of said input values, some of which are independently variable corresponding with said independently variable input values;

generating from said input signals an output signal representative of said scalar output function;

storing in said system an intermediate function representative of said output signals;

changing said variable input signals by amounts of random character to produce output signals of differing magnitude some of which may produce output signals representative of improved scalar output functions;

thereafter repetitively changing said variable input signals by amounts dependent upon random selections; and

weighting the random selections by amounts related to the magnitude of the earlier changes which produced output signals representing improved scalar output functions.

APPENDIX V.

The Benson and Tabbot Invention.

Before considering the Benson and Tabbot method of converting binary coded decimal (BCD) signals to binary signals, the following background of the binary and BCD number notations will be helpful.

The Binary Notation.

In the binary notation, the digits "1" and "0" are placed in positions having values based on sequentially ascending powers of 2 which increase from right to left. The values assigned to these positions are:

128 64 32 16 8 4 2 1

In the binary notation, the number "one" is represented by placing a "1" in the first position and a "0" in all other positions as follows:

128	64	32	16	8	4	2	1	
0	0	0	0	0	0	0	1	"One"

For convenience, the values of the positions are given above each of the binary and BCD numbers.

The number "two" is represented by placing a "1" in the second position and "0's" in all other positions as follows:

128	64	32	16	8	4	2	1	
0	0	0	0	0	0	1	0	"Two"

The number "three" is written by adding the binary number one to the binary number two as follows:

128	64	32	16	8	4	2	1	
0	0	0	0	0	0	1	1	"Three"

The binary number nineteen is written by adding to the binary three a "1" in the position having a value of sixteen:

128	64	32	16	8	4	2	1	
0	0	0	1	0	0	1	1	"Nineteen"

The binary number forty-eight is written as the sum of thirty-two and sixteen as follows:

128	64	32	16	8	4	2	1	
0	0	1	1	0	0	0	0	"Forty-Eight"

The binary number fifty-three is written by adding a binary four and a binary one to forty-eight as follows:

128	64	32	16	8	4	2	1	
0	0	1	1	0	1	0	1	"Fifty-Three"

The Binary Coded Decimal (BCD) Notation.

In the BCD notation, the values assigned to the positions are different but the notation is similar to binary in that the numbers are written by placing a "1" or a "0" in the positions having these values. For example, the BCD number "three" is:

80	40	20	10	8	4	2	1	
0	0	0	0	0	0	1	1	"Three"

Note that the first four positions from the right are assigned the same value as in the binary notation, but that the next four positions have different values. Any number less than ten is the same in both the binary and the BCD notation. For example, the number three is the same in both notations. However, in BCD the number nineteen is different from the binary notation. It is represented by a "nine":

80	40	20	10	8	4	2	1	
0	0	0	0	1	0	0	1	"Nine"

Plus a "ten":

80	40	20	10	8	4	2	1	
0	0	0	1	0	0	0	0	"Ten"

to give:

80	40	20	10	8	4	2	1	
0	0	0	1	1	0	0	1	"Nineteen"

The BCD number "fifty" is written as:

80	40	20	10	8	4	2	1	
0	1	0	1	0	0	0	0	"Fifty"

and the BCD number "fifty-three" is written by adding three to fifty to give:

80	40	20	10	8	4	2	1	
0	1	0	1	0	0	1	1	"Fifty-three"

Converting BCD to Binary.

For many reasons, a change, or conversion, from a BCD number to a binary number is necessary. Consider the pencil and paper technique for converting from BCD to binary.

First, consider the conversion of the BCD number three:

80	40	20	10	8	4	2	1	
0	0	0	0	0	0	1	1	"Three"

into binary form. The reader knows that all numbers less than ten are the same in BCD and binary form so he can merely write the binary number three as follows:

128	64	32	16	8	4	2	1	
0	0	0	0	0	0	1	1	"Three"

Now consider the conversion of the BCD number ten into binary. The BCD number ten is:

80	40	20	10	8	4	2	1	
0	0	0	1	0	0	0	0	"Ten"

The reader knows that the binary number ten is written by a binary eight plus a binary two. The first step in converting the BCD number into binary is to erase, or mask the "1" in the ten's column of the BCD number. This gives:

80	40	20	10	8	4	2	1	
0	0	0	0	0	0	0	0	"zero"

The second step is to add a binary eight to give:

	80	40	20	10	8	4	2	1	
	0	0	0	0	0	0	0	0	
+	0	0	0	0	1	0	0	0	zero plus eight equals "eight"
	0	0	0	0	1	0	0	0	

The third and final step is to add the binary number two to produce:

	80	40	20	10	8	4	2	1	
	0	0	0	0	1	0	0	0	
+	0	0	0	0	0	0	1	0	Binary eight plus binary two equals binary "ten"
	0	0	0	0	1	0	1	0	

As a final example of converting BCD to binary numbers by pencil and paper, consider the conversion of the BCD number fifty-three:

80	40	20	10	8	4	2	1	
0	1	0	1	0	0	1	1	"Fifty-Three"

First, the reader knows that three is the same in BCD and in binary so he will leave unchanged the "1's" in the

first two positions. The next "1" is in the "tens" position. The reader will erase, or mask, this "1" to give:

80	40	20	10	8	4	2	1
0	1	0	0	0	0	1	1

The reader will replace this BCD ten with a binary ten by first adding a binary eight and then adding a binary two as follows. Adding the binary eight gives:

	80	40	20	10	8	4	2	1
	0	1	0	0	0	0	1	1
+	0	0	0	0	1	0	0	0
	0	1	0	0	1	0	1	1

The number being converted plus binary eight equals a number intermediate BCD and binary.

Next, the reader will add binary two as follows:

	80	40	20	10	8	4	2	1
	0	1	0	0	1	0	1	1
+	0	0	0	0	0	0	1	0
	0	1	0	0	1	1	0	1

Number intermediate BCD and binary plus binary two equals new number intermediate BCD and binary

Proceeding to the left, the reader will next convert the "1" in the position having a value of forty from BCD to binary. First, he will erase, or mask, the "1" from this column to give

80	40	20	10	8	4	2	1
0	0	0	0	1	1	0	1

Number intermediate BCD and binary

He will replace this BCD forty with a binary 32 plus a binary eight. First, adding binary thirty-two gives:

	128	64	32	16	8	4	2	1
	0	0	0	0	1	1	0	1
+	0	0	1	0	0	0	0	0
	0	0	1	0	1	1	0	1

Number intermediate BCD and binary plus binary thirty-two equals new number intermediate BCD and binary

Finally, the reader will add a binary eight to give:

128	64	32	16	8	4	2	1
0	0	1	0	1	1	0	1
+ 0	0	0	0	1	0	0	0
0	0	1	1	0	1	0	1

Number intermediate BCD and binary plus binary eight equals binary fifty-three

A digital computer programmer can easily program a digital computer to automatically perform the conversion in exactly the same sequence of steps as that described above. There are other known techniques for converting BCD to binary numbers.* Benson and Tabbot recognized that the known techniques of conversion were wasteful of computer operating time and required a relatively large amount of computer storage capability. They invented a

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* The *Handbook of Automation, Computation and Control*, John Wiley and Sons, Inc., 1959, pages 2-17, suggests a conversion technique essentially similar to that described above. The handbook suggests summing the successive powers of the number expressed in the notation of the system into which the number is being converted. The handbook would convert BCD number 53 into binary by the following steps.

$N_{BCD}=0101 \quad 0011$ BCD fifty-three

$N_{BCD}=0\cdot10^1\cdot2^3+1\cdot10^1\cdot2^2+0\cdot10^1\cdot2^1+1\cdot10^1\cdot2^0+0\cdot10^0\cdot2^3+0\cdot10^0\cdot2^2+1\cdot10^0\cdot2^1+1\cdot10^0\cdot2^0$

$N=1\cdot(1010)\ (0100)+1\cdot(1010)\ (0001)+1\cdot(0001)\ (0010)+1\cdot(0001)\ (0001)$

$N_2=101000+1010+0010+0001=110101$ Binary fifty-three

Another technique for converting from BCD to binary is disclosed in U. S. Patent No. 3,026,035 Couleur. In accordance with this patent the BCD number is placed in a shift register. The BCD number is shifted out of the register one digit at a time. A binary three is subtracted from any decade having a binary count which is equal to or greater than eight after any shifting step. After the shifting is completed, the register contains a binary representation of the BCD number originally read into the register. The Couleur patent was relied upon by the Patent Office in rejecting some of the Benson and Tabbot claims. These claims were cancelled from the application.

computer process which performs the conversion more quickly and with less storage capacity.

The Benson and Tabbot Invention.

Benson and Tabbot perform the same masking and addition steps that were performed in describing the preceeding BCD to binary conversion. The difference is that Benson and Tabbot shift the number to be converted in such a manner that the masking is always performed on the same position (the second) and the addition is always performed on the same position (the first).

The Benson and Tabbot invention can be described by working the conversion with pencil and paper as was done by the reader in the previous section. However, doing the Benson and Tabbot conversion with pencil and paper is somewhat cumbersome; the advantage of their technique is gained only when it is performed on a machine. Therefore, the reader is respectfully cautioned that the following pencil and paper description of the Benson and Tabbot invention will be quite difficult to understand if the basic principles of the examples in the preceding sections are not thoroughly understood.

Benson and Tabbot perform their conversion in a reentrant shift register. A reentrant shift register is a device which shifts the positions of a BCD or binary number. Positions shifted out of one end of the register are inserted into the other end of the register. For example, consider the BCD number fifty-three:

80	40	20	10	8	4	2	1	
0	1	0	1	0	0	1	1	Fifty-Three

If this number is shifted one position to the right in a reentrant shift register, the number can be represented as:

1 0 1 0 1 0 0 1

If the BCD number fifty-three is shifted one position to the left it becomes:

1 0 1 0 0 1 1 0

If the BCD number fifty-three is shifted three positions to the right it becomes:

0 1 1 0 1 0 1 0

Benson and Tabbot convert by masking out each "1" and by replacing the masked out "1" with its binary equivalent. This much is the same as the pencil and paper technique previously described. The difference is that Benson and Tabbot shift the number in their reentrant shift register so that the masking is always performed on the same position and the binary additions are always made to the same position. Consider the example in which the BCD number fifty-three is converted to binary by the Benson and Tabbot method.

The example will be described with reference to the steps of the Benson and Tabbot claim 8. The first step is to store the binary coded decimal number fifty-three in a reentrant shift register so that the positions of this shift register are:

0 1 0 1 0 0 1 1

(2) The positions are shifted to the right by three places to produce:

0 1 1 0 1 0 1 0

(3) The binary "1" in the second position is masked out to produce:

0 1 1 0 1 0 0 0

(4) A binary "1" is added to the first position of the shift register to produce:

0 1 1 0 1 0 0 1

(5) The positions are shifted two places to the left:

1 0 1 0 0 1 0 1

(6) A "1" is added to the first position:

1 0 1 0 0 1 1 0

Thus far, Benson and Tabbot have performed the steps of masking out a "1" and replacing it with a binary eight plus a binary two. These steps were performed in the pencil and paper method of the previous section; however, in the Benson and Tabbot method, the masking was performed on the second position and both additions were made to the first position.

(7) The number is shifted to the right by three places to produce:

1 1 0 1 0 1 0 0

At this point there is a "0", not a "1" in the second position of the reentrant shift register. Therefore, the number is shifted to the right one position at a time until there is a "1" in the second position. Shifting to the right by one position gives:

0 1 1 0 1 0 1 0

Since there is a "1" present in the second position, this "1" is masked out to produce:

0 1 1 0 1 0 0 0

A "1" is added to the first position to produce:

0 1 1 0 1 0 0 1

(5) The number is shifted two places to the left to produce:

1 0 1 0 0 1 0 1

(6) A "1" is added to the first position to produce:

1 0 1 0 0 1 1 0

At this point, the Benson and Tabbot technique has completed the masking of the "1" in the "forty" BCD position and its replacement with a binary "thirty-two" and a binary "eight".

In order to complete the process, the number is shifted to the right by three places to give:

1 1 0 1 0 1 0 0

A test is made to determine if there is a "1" in the second bit position and since there is not, the number is shifted to the right by one position to produce:

0 1 1 0 1 0 1 0

Finally, the number is shifted to the right by one more bit position to complete the conversion:

128	64	32	16	8	4	2	1	
0	0	1	1	0	1	0	1	*Fifty-Three*

The advantage of the Benson and Tabbot technique over the normal conversion is that the masking is always performed on the second position and the addition is always performed on the first position. In the Benson and Tabbot technique, the number is shifted in the shift register so that the masking and addition can be always performed on these positions.

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IN THE

Supreme Court of the United States

OCTOBER TERM 1971

No. 71-485

ROBERT GOTTSCHALK, COMMISSIONER OF PATENTS,
Petitioner,

v.

GARY R. BENSON AND ARTHUR C. TABBOT,
Respondents.

ON WRIT OF CERTIORARI TO THE
UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS

BRIEF AMICUS CURIAE FOR THE AMERICAN PATENT LAW ASSOCIATION

I.

THE NATURE AND THE INTEREST OF THE AMICUS

A. The American Patent Law Association

This brief *amicus curiae* is submitted by the American Patent Law Association ("APLA")[1] under Rule 42(2) of this Court. Letters from the parties' counsel, consenting to the filing of this brief, are on file with the Clerk of this Court.

[1] APLA's membership-at-large elects the officers and others who form APLA's 20-member governing body, the Board of Managers. The filing of this brief on behalf of APLA has been authorized by the Board of Managers and approved by its Executive Committee.

APLA is a nationwide association of over 3,800 members. Its members include judges, law teachers, copyright and trademark lawyers, and over half the patent lawyers in the country from private, corporate, and government practice — persons interested in the intellectual property law of patents, trademarks, copyrights, and related antitrust.

Unlike some specialties of law practice where the plaintiffs and defendants are often represented by predominately separate legal fraternities, in patent law the same individual attorneys may appear as often on the plaintiff's side as on the defendant's side of patent infringement and trade secret suits, and on either the licensor or licensee side of negotiations for patent, trademark, trade secret, and know-how licenses. By such balance of experience and membership, this association considers itself well balanced in the realities of the patent law in action.

B. Interest of the Amicus

APLA has no interest in and takes no position with respect to the patentability of the particular invention of respondents' pending patent application.

APLA presents no position as to claim form or claim construction.

APLA is deeply concerned that the briefs of the *amici* who are computer hardware manufacturers and of the association of such manufacturers (hereinafter "Hardware Manufacturer Amici") advocate a sweeping rule of law of nonpatentability of nonobvious processes where such processes are capable of being practiced on a computer.

Perhaps more grave, various of the briefs in support of the petitioner present to the Court alleged statements concerning the functioning of the patent system which APLA feels are grossly erroneous as a basis for this or any other patent case.

II.

SUMMARY OF THE ARGUMENT

(1) The issue here is not whether a computer *program* is patentable, but whether a *process* — which may be performed by a general-purpose computer wired by the technique of programming — may be patented, assuming arguendo that it is within the useful arts and is new, useful, and nonobvious.

(2) The Constitution, Congress, and experts on the subject have found the patent system effective to promote the progress of the useful arts. In effect, there is Constitutional Finding of Fact, and a Congressional Finding of Fact, that the patent system is effective to promote the progress of the useful arts.

(3) At least some computerized processes are within the useful arts, and are also new, useful and nonobvious.

(4) Congress has expressly defined patentable processes as including new uses of known machines. 35 U.S.C. § 100(b). There is no basis for excluding a process from that statutory definition merely because the machine upon which the process is implemented is a computer.

(5) If there is to be a carving out of *some* useful arts or new uses of *some* known machines for a new nonpatentable class, the carving out from the present statutory classes should be done by Congress.

(6) The patent system is based on sound public policy; accordingly, it merits correspondingly fair treatment by the courts.

(7) The incentive to disclose, which incentive is fostered by the patent system, is desperately needed with re-

spect to processes performable on general-purpose computers.

(8) A new, useful, and nonobvious invention — whether or not it is a process performed by a general-purpose computer — is not and never was *de facto* in the public domain. It adds to, and does not subtract from, that which the public was previously enjoying.

(9) There are a number of alleged issues that have been urged upon this Court but that are not relevant to the *legal* determination of whether a programmable process can ever be patented. Those non-issues are:

(a) The status of the Patent Office's collection and classification of the relevant prior art.

(b) The status of foreign patent laws.

(c) The status of related (but different, and questionable) copyright protection.

(d) The status of private and bar committee suggestions about what the law *ought* to be.

III.

ARGUMENT

A. Identification of the Issues

This *amicus* takes no position on the form of the claims in the patent application in suit. But the disclosure and claims of the application are directed to an invention which is a process for using a computer to do a useful and often tedious technological task, converting binary coded decimals ("BCD") to binary numbers; and that invention identifiable from the whole of the application is the invention to which this brief is directed.

There was no Patent Office rejection for obviousness. The Benson and Tabbot invention *as a whole*, which to this *amicus* includes the broad Benson and Tabbot concept of how to convert BCD to binary and also the specific computer process described in the application for patent to implement that concept, is for purposes of this record conceded to be nonobvious from what was old.

The computer in accord with the invention operates differently from that same computer when used by the John Doe prior art way to convert BCD to binary numbers — differently from the same computer when used by the Richard Roe prior art way to convert BCD to binary numbers.

Being both new and nonobvious to those of ordinary skill in the art at the time the invention was made, it also was not yet then within the reach of the public to enjoy — for the public did not know how to operate a computer by the Benson and Tabbot process.

Regardless of what it may be called, application of law of nature or process performable on a machine, the Benson

and Tabbot process was not, *de facto*, in the public domain. The question is whether it is *de jure* in the public domain.

When nonobviousness is assumed, it must be on the record before this Court, it is clear that the following premise applies:

> Though the computer programmed in a new way
> operates in one sense
> as its designers intended,
> it operates in another sense
> differently from the way
> anybody had ever operated it before.

This difference in mode of operation is a process that is a useful art — it gets man's tedious job done for him better than before.

The first issue which this *amicus* joins with the briefs on file is:

> Whether progress in *this* useful art,
> as in others,
> is promoted by securing to inventors,
> for limited times,
> exclusive rights to their
> new, useful and nonobvious inventions.

Amicus develops that both the Constitution (art. I, § 8, cl. 8) and the Congress (Title 35, U.S.C.) have answered that question in the affirmative, then proceeds to the second issue:

> Whether there is anything special
> in new, useful, and nonobvious processes
> performable on a computer
> which renders that affirmative answer
> inapplicable to such processes.

Phrased differently:

> Whether a process
> fully meeting the criteria of Title 35, U.S.C.
> may be deprived of its patentability
> merely because
> it is capable of being implemented
> (or perhaps can *only* be practically
> implemented) by a computer.

The real issue does not turn on whether there is a law of physics, chemistry, mathematics, or other law of nature involved. All inventions are applications of laws of nature. There can be no other kind of invention.

The issue does not turn on whether the computer operates consistently with the builder's design, such that the invention is nothing but a new use of an old thing, nor on whether this invention is merely a combination of old process steps. All inventions are nothing but new uses of old things, or combinations of old parts, materials or steps.

The Congress examined and discarded those factors as criteria for patentability, found them incapable of consistent guidance to bench or bar, and in 1952 enacted the nonobviousness standard[3] in lieu of prior standards.

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[3] Supreme Court opinions of prior years had used many expressions of the standard of patentability. In *Hotchkiss* v. *Greenwood*, 52 U.S. 248 (1850), the phrase was "ingenuity and skill" possessed by "an ordinary mechanic acquainted with the business." In *Cuno Engineering Corp.* v. *Automatic Devices Corp.*, 314 U.S. 84 (1941), the expression was "flash of genius." In *Great Atlantic & Pacific Tea Co.* v. *Supermarket Equipment Corp.*, 340 U.S. 147 (1950), synergism was required in language about the whole must equal more than the sum of its parts — which, by basic physics, is of course an impossibility. The 1952 code's choice of "obviousness to those of ordinary skill in the art" was the choice also found in *Loom Co.* v. *Higgins*, 105 U.S. 580, 591, (1882), quoted with approval in *Washburn & Moen Manufacturing* v. *Beat Em All Barbed-Wire Co.*, 143 U.S. 275 (1892).

Of that, more later. Suffice here to say that those alleged bases for judgment of the issue of patentability are not the issues; they only obscure and conceal the issue.

Patents have never been asserted as appropriate for computer programs as such, but only for useful processes, including those which may be performable on computers, and for computers in the program-wired state, when those processes and wired-states are new, useful, and nonobvious.

The series of "computer program" cases on the books, all decided by the Court of Customs & Patent Appeals, is limited. It includes *In re Prater*, 415 F.2d 1378 (1968), *modified on rehearing*, 415 F.2d 1393 (1969); *In re Bernhart*, 417 F.2d 1395 (1969); *In re Mahoney*, 421 F.2d 742 (1970); *In re Musgrave*, 431 F.2d 882 (1970); *In re Foster*, 438 F.2d 1011 (1971); *In re Benson*, 441 F.2d 682 (1971); *In re McIlroy*, 442 F.2d 1397 (1971); and *In re Waldbaum*, 457 F.2d 997 (1972).

Those cases enunciated two general legal conclusions dictated by the language of the statute:

(1) that programmed computers and the processes by which they operate, when in the "useful arts," are within the statutory classes of patentable inventions, i.e., machines and processes, respectively, as set forth in 35 U.S.C. § 101, and

(2) that, subject to the satisfaction of the three conditions for patentability, i.e., novelty, utility, and nonobviousness, as set forth in 35 U.S.C. §§ 101-103, programmed computers and the processes by which they operate are patentable inventions.

Arguments that those inventions involved "only an abstract idea," "law of nature," or "mental step" were rejected in those cases, presumably because they are not

relevant to the requirements for patentability and because the court construed the inventions to be new, useful, and nonobvious contributions to useful arts — which ended the matter.

The issue the CCPA decided in those cases was not whether processes performable on a computer *should* be patentable, but what *is* patentable subject matter under the present statute law.

What *should* be patentable is for the Congress and not the courts to decide. And there is a reason: Congress can hold public hearings to find out what is real-life fact as distinguished from speculation of *amici* on facts not in evidence before the Court.

B. The Meaning of "Program," "Software," and "Instant Hardware"

The issues tend to be confused by semantic problems which becloud understanding.

So for purposes of this brief:

"Hardware" is the assembly of disconnected and inoperative circuits and apparatus within what is called a computer.

Before the manufacturer turns a piece of hardware loose in its customer's office, the hardware is normally rendered practicable by the use of "systems software."

The "systems software" provides a coded input via machine-readable cards or magnetic tape by which switches are set to "wire" the computer circuits so they function in the manner determined by the wiring." Thus, when the computer is asked to multiply the sine of 35° by 98, the systems software enables the computer to provide the value of the sine of 35° for the multiplication and to carry out the multiplication function.

In one common usage "program" is often applied more synonomously with "applications software," namely a series of machine-readable representations on a deck of cards or magnetic tape which establishes the circuit and operation of the computer through its ultimate processes, for example, to optimize the design of a chemical refinery which from time to time may have to accept a variety of feed stocks and may be asked to produce a variety of products.

"Software" — which is a near synonym to "program" — is a generic name for various inputs to computers, sometimes including data for storage and use in the computer operation, and switch setters whereby the computer becomes wired up for the computer work that is to be done.

Software, or computer programs, are often called "instant hardware" because, upon their input to the general purpose digital computer, they cause it automatically to make some circuit connections so that it may process electrical signals in a way determined by the connections — a way that may be old and obvious or that may be new and nonobvious. In one sense, a general purposes digital computer may be regarded as but an organized storeroom of electrical components waiting to be interconnected in a particular manner by the introduction of a program. *In re Prater*, 415 F.2d 1393, 1403, n.29 (C.C.P.A. 1969).

Thus, programming a computer is simply one technique for wiring an electrical circuit which, until the computer is reprogrammed, operates just as though the circuit was hand-wired and soldered. It is the patentability of that circuit — which is operationally the same whether hand-wired or wired automatically in response to a program — and of the process performable on a programmed computer, that have been the real issues in the so-called "computer program" or "software" patent cases.

Some *amici* advocate that a program-wired circuit cannot be patentable while the corresponding hand-wired hardware circuit may be patentable (e.g. BEMA Br. 7, n.9). But the two circuits are operationally the same. If an inventor conceives a new, useful, and nonobvious process, as to which he can build a machine that operates without programming, or as to which he can also program an existing machine, by what logic can he be granted or denied a patent on that distinction in context of the constitutional purpose to induce him to invent the process? His patent should be to the new, useful, and nonobvious process that he invented, with such machine limitations, if any, as are necessary to the performance of the process.

It should be understood clearly:

> Neither in this case nor in other cases has it ever been urged that a computer program, *per se*, is patentable.
>
> The issues have concerned the patentability of machines (e.g. computers in their programmed or "wired" states) and processes (e.g., the processes according to which computers can be made to operate by the technique of programming).

C. Structure of the Patent System

1. *"The useful arts"*

The Constitution, art. I, § 8, cl. 8, gave to Congress the power "to promote the progress of . . . useful arts." Within a year of the event of the Constitution, i.e., in 1790, and every few decades since, Congress has passed a patent law to promote the progress of the useful arts.

So what is a useful art?

Is it useful to know a better way to make a candle? Perchance Benjamin Franklin thought so.

Is it useful to know a better way to make nylon? Is it useful to know how to make rubber so we don't have to get it from rubber trees in Java? These are useful arts.

Is it useful to enable one machine, which speaks in decimal digits like a dial phone, to communicate with another machine which is controlled by a digital computer in a process for making jet engine parts?

These useful arts are to be contrasted with and distinguished from the "fine arts" of music, sculpture, and the like.

New processes for enabling one machine to talk to another machine are useful processes, whether or not they are performed on a machine of any special type.

They are the kind of useful processes that the Constitution and Title 35, U.S.C., were talking about, because they are the kind that these documents seek to induce people to invent.

2. *What is a patent, really?*

A patent is a grant of the right to preclude others from making, using, or selling for 17 years. 35 U.S.C. § 154.

By 35 U.S.C. § 261 a patent is stated to "have the attributes of personal property" — a socially favored concept — in contradistinction to the disfavored concept of "monopoly." As between the purr words "personal property" and the common slur word "monopoly," Congress chose the words "personal property" to characterize the public policy underlying the patent right to preclude others for a limited time from use and enjoyment.

Inherently there seems to be something right and socially favored in the concept that one who puts his perspiration and capital into making something new for mankind, should

enjoy a property right in the idea that his perspiration and capital produced if it is new, useful, and nonobvious. And as developed in the Appendix to this brief the patent system indeed functions for the benefit of all peoples of the nation.

Socially beneficial grants sanctioned by both the Constitution and Congress should not be disfavored in our law.

3. *Subject matter patentable*

In the constitutional authorization for the patent, the thing, the *res* of the patent's protection, is a "discovery." The Constitution refers to the discoveries of "inventors" but not to "inventions." Thus, the system in constitutional contemplation was a generally conceived system with few particulars. It was directed to all the learnings ("discoveries") of inventors (those who work at innovation) which are in the useful arts.

The Constitution did not limit the type or stature of the discovery that is patentable, so long as protecting the discovery was part of a program or system intended for the purpose of advancing the useful arts.

But Congress limited the type of *res* that could be patented to any new and useful

(1) process,

(2) machine,

(3) article of manufacture,

(4) composition of matter, and

(5) improvements on any of them. 35 U.S.C. § 101.

Congress defined "process" in language of peculiar interest to the present case:

> "'Process' means process, art or method, and includes a new use of a known . . . machine . . . ." 35 U.S.C. § 100(b).

Some courts over the years have said that a person gets the privilege of *all* uses of his machine. But Congress clarified this in 1952. Congress specifically declared otherwise as to new *non*obvious uses of a machine, for they are patentable to the discoverer of that new nonobvious use.[3]

In addition to deciding that the *res* should be a process, machine, manufacture, composition, or improvement in one of them, Congress decided also that the *res* that could be patented must be:

(1) new (35 U.S.C. § 101, 102);

(2) useful (35 U.S.C. § 101); and

(3) as a whole, not obvious to those in the art at the time that it was made (35 U.S.C. § 103).

Insofar as the stature of the innovation is concerned, novelty, utility, and nonobviousness are referred to as the three conditions for patentability. There are no others. After 160 years of experience with patents, the Congress in 1952 wrote a new statute that contained no other requirements.

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[3] Stripped to their essentials, the briefs of some *amici* (the hardware manufacturers) advocate that this Court should carve out an exception to the statute, and deny patents on new discoveries of processes by which *certain* old machines can be used, thereby to provide unique immunity from patent infringement liability for users of *such* machines, irrespective of the user's plagiarism of discoveries by others of nonobvious and highly useful manners in which those machines may be altered or used to get the desired results.

APLA can find no reason why such machines, *i.e.*, computers, should not be treated like all other machines, since Congress expressly wrote to all machines without special exception.

4. *"Nonobviousness" is an horrendously high standard of patentability*

The most difficult part of patent law to understand is the pragmatics of the requirement for nonobviousness to those in the art. 35 U.S.C. § 103.

Just what is the level of the standard of the nonobviousness requirement of 35 U.S.C. § 103?

First note that § 102 defines the prior art.

The prior art includes foreign publications (including those in Chinese and Greek that never reach U. S. shores) that are rarely, if ever, generally known to U. S. inventors.

The prior art includes foreign patents (for example, those in Russia and South Africa) which rarely if ever are read in the United States.

It includes those college theses in the United States, Germany, and other foreign countries which enjoy printed publication only within the circles of college libraries. These are rarely, if ever, an economic place for an inventor to spend time looking for a solution to the problem facing him and/or the persons who pay his salary and finance his work. Only defendants in major patent infringement suits can afford to look for such references in pursuit of *de jure* justification of their plagiarism.

The prior art includes every prior public and commercial use which ever occurred in this country. Many of these prior uses, not being available in printed publications, cannot be known to those who put in the perspiration[4] and the capital[5] to make new inventions.

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[4] Edison commented that inventions were 99% perspiration and only 1% inspiration.

[5] Most complex scientific inventions of today are exceedingly high risk investments, often costing million of dollars to develop to the stage of market enjoyment and proving to be lost causes in a significant percentage of cases.

There are a hundred-thousand odd pending U.S. patent applications. When applications issue into patents, they become *de jure* references retroactively back to their filing date, even though they were not then available to public access and could not be used by other researchers at that time.

De jure prior art includes many reference sources which innovators cannot get at or which they cannot economically afford to use, i.e., reference sources which do not in fact give the public an in-house enjoyment of the devices in the references.

Often the courts assert that a combination of the teachings of several of these *de facto* not-available references renders a patent invalid for obviousness.

Even if a given man "knows" of all of these references (which no inventor can), it is of course impossible to conceive that an inventor could at any one time have present *cognizance* of them all. It is still more impossible that he could have such cognizance as to be able, from the millions of jig saw pieces of prior knowledge that he "knows" of, to see clearly by foresight which ones would fit together for a new combination he seeks to patent.

The standard of nonobviousness thus puts a heavy burden on the inventor *and those who finance him.*

It follows that with such a standard of patentability, there cannot be a burdensomely large hoard of patent applications or issued patents on computer process inventions.

The burden of nonobviousness requires that "the invention *as a whole*" (not just its parts) must not be obvious. Thus, the "whole" includes enough of each (i) abstract concept, and (ii) specific steps and/or structure to give

the public a practical realization of the invention. For if that "whole" is not obvious from such a collossus of *de jure* prior art, the useful arts need to be promoted before the public can enjoy ~~it.~~ the invention.

A concept, whether it be a law of nature or a principal of mathematics, that is given useful application in a machine or process is inherently either part of the prior art or part of the "invention as a whole." See 35 U.S.C. § 103. Such a concept, if never before known or enjoyed by the public, is *ipso facto* not part of the prior art against which obviousness can be measured. It therefore must be part of the invention "as a whole."

5. *There are no other requirements for patentability besides novelty, utility, and nonobviousness*

Sections 101, 102, and especially 103 (nonobviousness) were drafted in 1952 to remove the conflicts then common in the case law which contained many diverse expressions* of the requirements for patentability, including the requirements that

(1) there be synergism in the assembly of the parts;

(2) the patent not be directed to a mere use of a law of nature;

(3) the invention not be a new use of an old device; and

(4) the invention not be merely a combination of old elements.

Sections 100-103 of the 1952 Patent Act substituted nonobviousness for those and other similar requirements for patentability.[6]

[6] See Rich, *Principles of Patentability*, 28 Geo. Wash. L. Rev. 393 (1960); Rich, *The Vague Concept of "Invention" as Replaced by § 103 of the 1952 Patent Act*, 8 (Conf. No.) Idea 136 (1964).

All inventions are new uses of old devices or combinations of old elements; all inventions are applications of laws of nature. The question is *which* of those are entitled to patents.

Congress clearly provided in section 103 that the nonobvious ones — which *ipso facto* are not in the public domain — are the ones which are patentable.

This is the heart of a system that induces the invention and market development of such useful things as are not *ipso facto* yet in the public enjoyment.

As Mr. Chief Justice Burger once observed, the system is not concerned with what the individual patent does.[1] The patent system is concerned with inducing a flow of progress in all the arts and from many people.

The patent grant induces publication of secrets

And this flow of progress is effected by a series of phenomena beyond reward for successful invention and marketing. For example, the statute specifies that the patent application

> shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same. 35 U.S.C. § 112.

that full description, upon allowance of the application, is published in the patent. Thus, others may learn promptly, upon the grant of a patent, of the discovery disclosed thereby, and may build new inventions upon the old.

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[1] *Comm'r of Patents v. Deutsche Gold-Und-Silber-Scheideanstalt Vormals Roessler*, 397 F.2d 656, 667 (D.C. Cir. 1968).

That is the contract the government makes with the patentee: 17 years of protection of this *res*, not before known or enjoyed, in exchange for public disclosure *now*.

7. *The reality of patent law in action: Unbiased blue ribbon committees and individuals have consistently found that the patent system does, in fact, promote the progress of the useful arts to which it applies*

Other *amici* have implied that patents (or, as they prefer to say, "monopolies") obstruct rather than promote the progress of the subject art (BEMA Br. 9-13, 16-19; Bur. Br. 5, 17-22; Hon. Br. 17-18; IBM Br. 2,6,19).

Contrary to the positions of those *amici*, APLA feels that the incentives of the patent system work well, and work well in all useful arts. There is no need to carve out processes performable on a computer for special treatment.

There is collected, as an Appendix to this brief, a group of quotations from famous experts on the economics of innovation, from Senate committees, Presidential Commissions, and the like, many having no patent interest of their own.

They are uniformly to the effect that, in its practical application to the useful arts, the patent system is much more merit than mischief. They teach that the patent system does in fact:

(1) provide effective incentive to invest labor in invention.

(2) provide effective incentive to invest money in inventions.

(3) provide effective incentive to the development of markets for inventions, without which the public

(4) provide effective incentive to break cesspools of secrecy and to induce disclosure of new inventions so that others may build still better inventions.

(5) promote competition by facilitating the little David's competition with industrial Goliath's.

These things it does in spite of inadequate search facilities, inadequate budget for the Patent Office, imperfect patent examiners often making judgments too harsh (and, as often, too lenient) on the patent applicant.

It is beyond controversy that the incentives provided by the patent system do promote the progress of the useful arts, not hinder it.

Some, if not all, computerized processes are within the useful arts to be promoted.

Processes are clearly within the wording of the statute, which includes new use of known machine, 35 U.S.C. § 100(b).

The statute having included all processes within the useful arts, no segment thereof should be judicially carved out of what Congress intended. Specifically, there is no statutory basis for excluding a process, or a new use of a known machine, from patentability merely because the process or new use is performed in a computer.

D. Has There Been a Functioning Free and Open Exchange of Computer Program Ideas?

It is strongly urged by the hardware manufacturing *amici* that there has been rapid growth and innovation in software development in the past, because of what they allege has been an atmosphere of free and open exchange of computer program ideas. They conclude that progress

in this useful art would not be served by permitting computer-implemented processes to be patented.

However, the allegation of free and open exchange of ideas is unsupported by evidence and is questionable.

It would be interesting to determine by credible evidence, which happens not to be before the Court, whether there has not long been perchance a billion dollars worth or more of software marketed every year under some form of secrecy contract. If this be so, then there has not been a free and open exchange of ideas.

And, it would be pertinent to determine, by credible evidence not before the Court, whether the alleged free and open interchange of ideas has not been in large measure confined to that significant segment of software which the hardware manufacturers have (uniformly until recently) given away "free" as an aid in selling hardware.[4]

It would be interesting to determine whether the publication of new program ideas, which is an inherent part of obtaining a patent on them, might serve a social purpose in inducing public disclosure of program ideas now held secret.

The patent system is designed to promote disclosure of inventions to the public through issuance of patents, the patent owner retaining the temporary right to control who can use his invention. Whether or not past growth of software technology has been sponsored substantially by hardware manufacturers, its future — or that of any other useful art — should not be burdened by automatic exclusion from the benefits of patenting. The carving of excep-

[4] The biggest of the hardware manufacturers "unbundled" applications software from hardware about three years ago, but much software remains "bundled" with hardware.

tions from 35 U.S.C. § 100(b) should be left for the Congress to decide after full investigation and public hearings.

E. A Process, Otherwise Patentable, Is Not Rendered Unpatentable Because It Is Performable by a Known Machine

It has been implied and argued to this Court, in varying degrees, that

(1) a programmable process (i.e., a process according to which a general-purpose computer can, by the technique of programming, be made to operate) — even if new, useful, and nonobvious — is not patentable because it is the function of the computer, and

(2) that the lower court, by its decision in *In re Tarczy-Hornoch*, 397 F.2d 856 (C.C.P.A. 1968), has somehow rejected certain doctrines established by this Court respecting the patentability of machine processes.

That neither of those arguments has any merit is most effectively demonstrated by *Tarczy-Hornoch* itself and the scholarly research and analysis of Examiner-in-chief Bailey of the Patent Office Board of Appeals in his opinions in *Ex parte Goldsmith*, 94 *U.S.P.Q.* 403, 405 (1952), *Ex parte Symons*, 134 U.S.P.Q. 74 (1962), and *Ex parte Packard*, 140 U.S.P.Q. 27, 34 (1963).

Finally, it should be remembered that 35 U.S.C. § 100(b) specifically defines patentable processes to include processes performable by a machine:

> "The term 'process' . . . includes a new use of a known . . . machine . . . ."

If the invention here in issue is a process performable on a machine, it is clearly not to be excluded for that reason alone.

F. Patent Office Collection and Classification of Prior Art

Petitioner and other *amici* urge that programmable processes should be unpatentable because the Patent Office has not, at present, adequately collected or classified the prior art (Pet. Br. 17, 30-33; BEMA Br. 14, n. 19, 23-24; Bur. Br. 19-20; Hon. Br. 18).

Computer process inventions are as readily classifiable as other process inventions.

For example: here, the invention can be classified as a method for converting BCD to binary, just as readily as a process for annealing glass can be classified for what it is. See, e.g., the Patent Office Manual of Classification, Class 340, Subclass 347, entitled "Code Converters (e.g. Rapid to Slow, *Decimal to Binary*)" (emphasis added).

The Patent Office can be depended upon to set up classifications for, and collect the art in, the processes of operating a computer in the same degree of thoroughness that it brings to other process arts.

In all events, the failure of the Patent Office, perhaps due to inadequate budgets or the like, to perform fully an administrative function, is not a proper *legal* ground for changing the law which Congress has enacted.

G. The Patentability of Programmed Computers and/or Programmable Processes in Foreign Countries Is Wholly Irrelevant to that Issue in this Country

Petitioner and other *amici* have suggested or urged that the incentives of the patent system should be denied insofar as programmable processes are concerned because certain foreign countries have held programmable processes unpatentable under their foreign patent laws (Pet. Br. 33, n. 33, BEMA Br. 26-28; IBM Br. 26-29).

However, many of the foreign countries whose patent offices or courts have made a detailed and thorough analysis of the issue, such as West Germany, Great Britain, and Canada, have plainly held that programmed computers and/or programmable processes *do* constitute patentable subject matter. But neither that fact, nor the fact that some other countries may have reached the opposite result, has any bearing on this case.

H. Patent Protection Is Not Precluded by the Existence of Copyright Protection Even Assuming Arguendo that the Latter Exists

Petitioner and certain *amici* have suggested or argued that computer programs may be copyrighted and that, *ipso facto*, programmed computers and programmable processes either cannot or should not be patented or patentable (Pet. Br. 33, n. 32; IBM Br. 30-31; Bur. Br. 22-23; BEMA Br. 29-30; Hon. Br. 16, n. 25).

But it has already been firmly established that patent and copyright protection are *not* mutually exclusive. In *Mazer* v. *Stein*, 347 U.S. 201, 216-17 (1954), this Court squarely rejected the argument "that overlapping of patent and copyright legislation so as to give an author or inventor a choice between patents and copyrights should not be permitted," expressly stating:

> the patentability of the statuettes, fitted as lamps or unfitted, does not bar copyright as works of art. Neither the Copyright Statute nor any other says that because a thing is patentable it may not be copyrighted. We should not so hold.

The decision in *Mazer* was based upon the recognition that patents and copyrights confer quite different forms of pro-

tection[9] and that there are sharply different tests for patent and copyright validity.[10] 347 U.S. at 217-18. See also, *Baker* v. *Selden*, 101 U.S. 99 (1879).

Indeed, as applied to the computer field, the copyright laws may preclude another, for up to 56 years, from the copying of a writing (e.g., the set of coded instructions embodied in a computer program) which is merely original; on the other hand, the patent law may preclude another for only 17 years from the making, using, or selling of a machine (e.g., programmed computer) and/or a process (e.g., the method of operation of a programmed computer)[11] if the machine and/or process are new, useful, and nonobvious.

Moreover, the viability of computer program copyrights is entirely speculative. In the absence of a single decided case respecting computer program copyrights, a myriad of unresolved legal issues hang as a foreboding cloud over copyright protection for software.[12] However, since those

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[9] *E.g.*, an absolute right to exclude others from practicing an art or process, for example, as may be conferred by a patent, versus a right to preclude only the copying of the mere form of expression of an idea as may be conferred by a copyright.

[10] *E.g.*, the stringent novelty and nonobviousness tests for the patentability of inventions, versus the more relaxed originality test for copyrightability of writings.

[11] The patent statute expressly defines "process" as also including "a new use of a known . . . machine." 35 U.S.C. § 101(b).

[12] *E.g.*, whether computer programs, at least when presented in certain forms, are "writings" or "copies" within the meaning of the Copyright Act. Compare Petitioner's, BEMA's, and Burroughs' analogy of a computer program to a punched paper tape or roll for a player piano (Pet. Br. 26; BEMA Br. 8; Bur. Br. 23, n. 44), with *White-Smith Music Co.* v. *Apollo Co.*, 209 U.S. 1 (1908), holding that a player piano roll was not copyrightable.

See also, Brown Instrument Co. v. *Warner*, 161 F.2d 910, 911 (D.C. Cir.), *cert. denied*, 332 U.S. 801 (1947)("[a]rticles intended for practical use in conjunction with a machine are

issues are not now before the Court, suffice it to say that there is absolutely no support for the bald assertion that copyright *protection* — as contrasted with copyright *registration*[13] — is presently available for computer programs, much less for machine-performable processes as are here in issue.

I. The Pending Extra-Congressional Considerations of New, Tailor-made Proprietary Rights for Computer Programs Are Irrelevant to the Issue of Patentable Subject Matter

Admittedly, a number of individuals, companies, and bar groups have recommended and are studying the feasibility of a new statutory law granting a specific, tailor-made proprietary right for computer programs (BEMA Br. 29, 31; Bur. Br. 24; IBM Br. 31-33).

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not copyrightable"); Ringer & Gitlin, *Copyrights* 17-18 (rev. ed. 1965):

> Devices for measuring, computation, or use in conjunction with a machine frequently contain printed matter, such as numbers, letters, words, calibrations, or graphic material arranged in certain ways. Material of this sort is not subject to copyright since it is necessarily dictated by the method or principle underlying the device, and lacks the creative expression that is essential to original authorship.

[13] Even though copyright *registration* may be a prerequisite to to the maintenance of a copyright infringement action, *Vacheron & Constantine-LeCoultre Watches, Inc.* v. *Benrus Watch Co.*, 260 F.2d 637 (2d Cir. 1958), copyright *protection* is secured, if at all, merely by publication with the statutory notice, not by registration. 17 U.S.C. § 10; *Washingtonian Publishing Co.* v. *Pearson*, 306 U.S. 30, 39 (1939). Unlike a patent, which is a government grant made by the Commissioner of Patents after a careful examination, a copyright registration is not a grant; and the Register of Copyrights performs merely ministerial duties in contrast with the judicial and discretionary functions performed by the Commissioner of Patents. *Vacheron, supra*, 260 F.2d at 645. Thus, the Copyright Office has a policy of resolving doubtful issues in favor of registration wherever possible; and, on that basis only, have registrations of copyright for computer programs been issued — leaving the legal issues for subsequent judicial determination. *Copyright Office Circular No. 61*, May, 1969.

But the new forms of protection under consideration are primarily for protection of nonpatentable (e.g., obvious) computer programs as such, by contrast with nonobvious machine-performable processes here in question. At least some if not all of those proposals do not pre-empt or replace, but rather embrace and rely upon, the patentability of nonobvious programmable processes within the useful arts.

The law *is* as Congress has *already* written it, not as one may hope Congress may write it in the future. Today, the only clear statutory protection in this area is for new, nonobvious processes in the useful arts. 35 U.S.C. §§ 100-103.

CONCLUSION

A process which meets the requirements of the statute, 35 U.S.C. §§ 101-103, is patentable irrespective of whether it is a process performable on a computer.

A process which is otherwise patentable subject matter should not be excluded from patent protection merely because it can be performed by a computer.

Whatever the Court's disposition of the case before it, those principles should be clearly preserved in the Court's opinion.

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APPENDIX

The Patent System Promotes the Progress of Useful Arts

The 1966 *Report of the President's Commission on the Patent System* stated, at pages 1-3:

> The United States patent system is an institution as old as the Nation itself. Stemming from a Constitutional mandate, patent acts were passed in 1790, 1793, and 1836. The Act of 1836 established the pattern for our present system by providing statutory criteria for the issuance of patents and requiring the Patent Office to examine applications for conformance thereto. Although the law has been amended on numerous occasions — and even rewritten twice since 1836 — no basic changes have been made in its general character in the succeeding one hundred and thirty years.
>
> . . . .
>
> Agreeing that the patent system has in the past performed well its Constitutional mandate "to promote the progress of . . .useful arts," the Commission asked itself: What is the basic worth of a patent system in the context of present day conditions? The members of the Commission unanimously agreed that a patent system today is capable of continuing to provide an incentive to research, development, and innovation. They have discovered no practical substitute for the unique service it renders.
>
> First, a patent system provides an incentive to invent by offering the possibility of reward to the inventor and to those who support him. This prospect encourages the expenditure of time and private risk capital in research and development efforts.
>
> Second, and complementary to the first, a patent system stimulates the investment of additional capital needed for the further development and marketing of the invention. In return, the patent owner is given the right, for a limited period, to exclude others from

making, using, or selling the invented product or process.

Third, by affording protection, a patent system encourages early public disclosure of technological information, some of which might otherwise be kept secret. Early disclosure reduces the likelihood of duplication of effort by others and provides a basis for further advances in the technology involved.

Fourth, a patent system promotes the beneficial exchange of products, services, and technological information across national boundaries by providing protection for industrial property of foreign nationals.[1]

See also, Bush, "Proposals for Improving the Patent System," *Study of the Subcomm. on Patents, Trademarks, and Copyrights of the Senate Committee on the Judiciary*, 84th Cong., 2d Sess. 1 (1956):

Those who built the governmental structure under which we live were exceedingly wise, and they were particularly so when they created a strong patent sys-

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[1] Reprinted as S. Doc. No. 5, 90th Cong., 1st Sess. 9-11 (1967). Although the Commission recommended, for *policy* reasons not relevant to the present *legal* issue, a legislative *change* to exclude programmed computers and/or their processes from the patent system (Recommendation IV), it yet remains to be seen, after extensive public hearings subsequently held by Congress, why the above-quoted attributes of the patent system are not equally applicable to *all* segments of the useful arts, including programmed computers and their processes. Indeed, the patent law revision bills originally introduced prior to the congressional hearings included a provision implementing Recommendation IV. See Section 106, S. 1042, 90th Cong., 1st Sess. (1967). But, after congressional hearings, and after the Court of Customs and Patent Appeals made it clear in this and other cases that programmed computers and their processes *are* within the statutory classes of patentable subject matter, the recent patent law revision bills have omitted the provision excluding programmed computers and/or their processes from patent protection. S. 643 Comm. Print., 92d Cong., 1st Sess. (Oct. 20, 1971).

tem based on the Constitution. It has three great objectives:

First, it aims to stimulate both invention and the assiduous search for new applications of knowledge, which is the basis of invention. It does this by placing the inventor in a position to secure a reward.

Second, it seeks to create conditions whereby the venture of funds to finance the hazardous introduction into public use of new devices or processes will be warranted. This is done by protecting the industrial pioneer for a limited time against the uncontrolled competition of those who have not taken the initial financial risk.

Third, it aims to prevent the creation of an industry permeated by the intense secrecy with regard to its processes which characterized the medieval guilds and which can only retard the realization by the public of the benefits of scientific progress. This it does by extending a temporary monopoly to those who, in keeping with the American ideal of openness and frankness, will make a full disclosure of their new ideas so that they may be utilized to the full by those skilled in a particular art. [Footnotes omitted]

as well as the 1943 Report of the National Planning Commission, excerpted in Smith, *Patent Law* 39-40 (rev. ed. 1964):

The National Patent Planning Commission* First Report (1943) includes the following conclusions:

"The American patent system established by the Constitution giving Congress the 'power to promote the progress of science and useful arts,' is over 150 years old. The system has accomplished all that the framers of the Constitution intended. It is the only provision of the government for the promotion of invention and discovery and is the basis upon which our entire industrial civilization rests.

"The American people and their government should recognize the fundamental rightness and fairness of protecting the creations of its inventors by the patent grant. The basic principles of the present system should be preserved. The system has contributed to the growth and greatness of our nation; it has:

(1) encouraged and rewarded inventiveness and creativeness, producing new products and processes which have placed the United States far ahead of other countries in the field of scientific and technological endeavor;

(2) stimulated American inventors to originate a major portion of the important industrial and basic inventions of the past 150 years;

(3) facilitated the rapid development and general application of new discoveries in the United States to an extent exceeding that of any other country;

(4) contributed to the achievement of the highest standard of living that any nation has ever enjoyed;

(5) stimulated creation and development of products and processes necessary to arm the nation and to wage successful war;

(6) contributed to the improvement of the public health and the public safety; and

(7) operated to protect the individual and small business concerns during the formative period of a new enterprise." (pp. 783-84)

The Commission comprised Dr. Charles F. Kettering, Chairman of the National Inventors' Council and Vice-President of General Motors Corporation in charge of its Research Laboratories; Chester C. Davis, Member of the Board of Governors of the Federal Reserve System; Francis P. Gaines, President of Washington and Lee University; Edward F. McGrady, formerly First Assistant Secretary of Labor, then in charge of Labor Relations for Radio Corporation of America; Owen D. Young, Honorary Chairman of the Board of the General Electric Company and Member of the Board of Directors of Radio Corporation of America, the National Broadcasting Company, and the Federal Reserve Bank of New York City; Audrey A. Potter, Executive Director; and Conway P. Coe, then Commissioner of Patents, Executive Secretary.

and the 1966 Report of the Attorney General's National Committee to Study the Antitrust Laws, at pages 224-25:

> The private reward of the patent grant aims to achieve its public purpose in a number of ways. Prominent among these is the encouragement of the early disclosure of patentable inventions — and their ultimate availability to the public upon expiration of the patent. The offer of patent protection thus serves to head off the secrecy that might otherwise blanket the use of the invention. Second, the patent system seeks to achieve its public purpose by encouraging investment of risk capital. This is accomplished by affording a market within which the patent owner can invest and induce others to invest without fear of competition. New products and processes have always entailed competition. New products and processes have always entailed substantial investment at considerable risk. In recent years the expenditures required to this end have increased. By protecting such investment — and thereby encouraging new technologies — the patent seeks to increase competition by what is superficially an inconsistent grant of monopoly, but is in fact a mechanism intended to assure competition in invention. [Footnotes omitted.]

Indeed, the patent system promotes progress in the useful arts "by stimulating inventive activity, by bringing about a disclosure of the results of that activity, and by encouraging investment in the production and marketing of inventions as well as in research and development." Rich, *Principles of Patentability*, 28 Geo. Wash. L. Rev. 393, 400-01 (1960). "The patent law is an incentive system." Rich, *Infringement Under Section 271 of the Patent Act of 1952*, 35 J. Pat. Off. Soc'y 476, 477-78 (1953).

A. *By Providing Incentive to Invent*

As early as 1890, *Robinson on Patents*, § 20, stated:

> The grant of an exclusive privilege to the inventor

> is intended to advance the interest of the public, not by securing to it the knowledge and the use of that particular invention, but by rewarding the inventor and thus stimulating him, as well as others, to new efforts. . . .

As stated by Congressman Roudebush, 108 Cong. Rec. 2303-04 (1962):

> [T]he industrial supremacy enjoyed by the United States in a large part is attributable to well conceived patent laws which have stimulated creativity since our Republic was founded.
>
> . . . .
>
> . . . . [A patent] is a reward for the invention of a product or process which never existed previously. It does not grant any rights to an individual with respect to existing products or processes. Our Founding Fathers believed that the granting of a patent by the Government which confers certain exclusive rights upon the inventor for a limited time promotes the urge to create and discover for the benefit of everyone.

None other than Abraham Lincoln said, "The patent system . . . secured to the inventor, for a limited time, the exclusive use of his invention; and thereby added the fuel of *interest* to the fire of genius, in the discovery of new and useful things." 3 *The Collected Works of Abraham Lincoln* 361 (R. Basler ed. 1953).

This Court, in *Mazer v. Stein*, 347 U.S. 201, (1954), opined:

> The economic philosophy behind the clause empowering Congress to grant patents and copyrights is the conviction that encouragement of individual effort by personal gain is the best way to advance public welfare through the talents of authors and inventors in "Sci-

ence and useful Arts." Sacrificial days devoted to such creative activities deserve rewards commensurate with the services rendered.

b. *By Providing Incentive to Disclose Inventions*

In *Sinclair & Carroll Co.* v. *Interchemical Corporation*, 325 U.S. 327, 330-31 (1945), this Court said:

> The primary purpose of our patent system is not reward of the individual but the advancement of the arts and science. Its inducement is directed to disclosure of advances in knowledge which will be beneficial to society; it is not a certificate of merit, but an incentive to disclose. [Footnote omitted.]

See also *Robinson on Patents* § 39 (1890):

> [The patent system] removes from the inventor all inducement to conceal his discovery, by affording him the same protection that could be obtained by the most rigid secret. It encourages him to make known his results, as the method of securing for himself the largest recompense. It compels him to acquaint the public, thoroughly and at the outset, with all the details of his invention and with the various modes of benefiting by its use.

As Rich, *Principles of Patentability*, 28 Geo. Wash. L. Rev. 393, 400 (1960), points out,

> *patented* inventions are published and become a part of the technical literature. Thus publication itself promotes progress in useful arts and it is the prospect of patent rights which makes it available. Whenever novel subject matter, unobvious to workers of ordinary skill in the art, is published, progress in the art is promoted. The literature of the art is enriched, another way of doing something is known . . . .

Thus, one of the fundamental attributes of the patent system is to encourage disclosure of inventions. It stretches

redulity to even suggest that the patent system is the ause, rather than cure, of the secrecy that presently pre- ails with respect to programmable processes.

C. *By Providing Incentive to Invest In Making Inventions and Bringing Them to Fruition, Thereby Stimulating Competition*

Judge Frank, in his now famous concurring opinion in *Picard v. United Aircraft Corp.*, 128 F.2d 632, 642-43 (2d Cir., *cert. denied*, 317 U.S. 651 (1942), understood the value of patents

> which, through hope of rewards to be gained through such a monopoly, will induce venturesome investors to risk large sums needed to bring to the commercially useful stage those new ideas which require immense expenditures for that purpose.
>
> . . . .
>
> But if we never needed, or do not now need, patents as bait for inventors, we may still need them, in some instances, as a lure to investors. It is sometimes said that there is no need thus to coax investors because our giant corporations, with their research laboratories, will, without such bait, do the needful. The answer perhaps is that industrial history discloses that those corporations at times and to some extent, have been prodded into undertaking such research and into developing improvements because of the threat of competition from occasional "outsiders,"* armed with patent monopolies, and supplied with funds by a few enterprisers. Thus, paradoxically, monopoly may evoke competition: The threat from patent monopolies in the hand of such "outsiders" may create a sort of competition — a David versus Goliath competition — which reduces the inertia of some huge industrial aggregations that might otherwise be sluggish.

* By "outsiders" I mean persons outside the giant corporations.

I happen to know of one inventor who, together with his friends, spent many thousands of dollars and years of effort in bringing to the stage of practical utility a patent that markedly advanced the art in an industry the major established components of which were uninterested in new processes. Without those large financial outlays — which would not have been made but for the hope of acquiring a valid patent monopoly — the public, in all liklihood, would have been deprived of very real and substantial benefits. It would seem to be both unfair and unwise to apply so severe a test of invention as to render such a patent invalid.

. . . .

And so patent monopolies may still be socially useful; they may, indeed, as I have said, foster competition. The David Co. v. Goliath, Inc. kind of competition is dependent on investment in David Co. — the small new competitor. And few men will invest in such a competitor unless they think it has a potential patent monopoly as a slingshot. [Selected footnotes omitted.]

See 1 Deller, *Walker on Patents* § 8 (2d ed. 1964), which egins, "The granting of patents is a potent force in the ompetitive enterprise system." In addition to competition rom existing noninfringing inventions, a patented inven- ion often stimulates new inventions resulting from efforts o design around the patent. Witness the photocopying art, ecognized for its patent coverage, and the vigorous com- etition as, for example, Xerox brought to Thermofax, and BM has recently brought to Xerox. Patents are good, not ad, monopolies which stimulate, rather than stifle, com- etition. *Sears, Roebuck & Co.* v. *Stiffel Co.*, 376 U.S. 225, 30-31 (1964); *James P. Marsh Corp.* v. *United States ouge Co.*, 129 F. 2d 161, 165 (7th Cir. 1942); Rich, *The ague Concept of "Invention" as Replaced by § 103 of the 952 Patent Act*, 8 (Conf. No.) Idea 136, 139 (1964).

Harvard University Professor of Economics Wassily W. Leontief, in his introduction to Silk, *The Research Revolution* (1960) states:

> This unlimited, universal availability of knowledge and ideas produced by research is certainly a very desirable property for the society, for mankind as a whole. But it creates a serious problem for anyone who would like to engage in research, i.e., in the production of knowledge as a business enterprise. To justify investment in research a corporation must be able to sell its results directly — or indirectly, as a component part of some other product, for a price. But who would pay for a good which, once it has been produced, becomes available to everyone in an unlimited amount? Why not wait until someone else pays for it or invests in its production and then have a free ride?
>
> The patent, the copyright, and the licensing laws take care of this. They provide the quantity dimensions for objects which intrinsically have none and thus make it possible for private enterprise to engage in the production of ideas and new knowledge and sell or use them profitably as one can use or sell steel or bread. This is an ingenious and, so far as it goes, a very effective solution of the problem; unfortunately, it is not quite effective enough. Under the patent and license system, the range of practical applications of new ideas is necessarily narrower than it otherwise could have been, and the total volume of human and material resources devoted to production of useful knowledge is necessarily smaller than it should be.

Similarly, Professor Gustave Drews in his 1951 book, *The Patent Right in The National Economy of the United States*, at page 130 observed:

> When it comes to marketing an invention which requires so-called risk money, particularly if the inventor is a man of limited means, the general opinion has been for years that a patent on the invention is very desirable, if not absolutely necessary.

See also, *In re Anthony*, 414 F.2d 1383, 1397-98 (C.C.P.A. 69), and the testimony of General Motors vice president harles F. Kettering, *Hearings Before the U.S. Temporary ational Economic Committee on the Investigation of Con- ntration of Economic Power*, pt. 2, at 341-45 (December 16, 1938).

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IN THE

Supreme Court of the United States

OCTOBER TERM, 1971

ROBERT GOTTSCHALK, Acting Commissioner of Patents,

Petitioner,

vs.

GARY R. BENSON and ARTHUR C. TABBOT,

Respondents.

On Writ Of Certiorari To The United States
Court Of Customs And Patent Appeals

BRIEF OF THE PATENT LAW ASSOCIATION OF CHICAGO AS AMICUS CURIAE

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BRIEF OF THE PATENT LAW ASSOCIATION OF CHICAGO AS AMICUS CURIAE

AUTHORITY TO FILE.

This Brief as *amicus curiae* in support of respondent is filed pursuant to Rule 42-2 of the Supreme Court. The letters of consent from the Petitioner and the Respondent are on file with the Clerk of the Court.

INTEREST OF THE PATENT LAW ASSOCIATION OF CHICAGO

The Patent Law Association of Chicago is an association of members of the Bar of various courts of the United States, particularly of the State of Illinois, making a specialty of the law of patents, trademarks, copyrights, or related fields of law. There are 725 lawyers in the Association, about 350 of which are members of private law firms and the remaining are employed by corporations.

Representing, as we do, both corporations and individuals, licensors as well as licensees, we are concerned with the application of the Patent Laws to methods for operating general purpose, programmable digital computers. We believe that an expression of our views on the definition of patentable subject matter under 35 U.S.C. 100(b) and 35 U.S.C. 101 will aid the Court in deciding the important issues raised by the present case and in placing the issues in proper historical perspective. We are particularly moved to file this Brief because it is the first time this Court has had the opportunity to rule on the question whether the Patent Laws as they stand today permit the granting of patents directed to electrical signal processing methods that are carried out on general purpose, programmable digital computers.

We have no concern with, and express no views on, the private interests of any party to this litigation. We are concerned, however, that there should be no rule established which would be unreasonably restrictive of, or not in complete accord with the Patent Statutes so as

to deprive inventors of their exclusive rights and reduce the incentive to advance the useful arts relating to digital computers.

STATEMENT OF PURPOSE.

As the present case brings before this Court for the first time the issue of whether a patent claim which defines a particular mode of operating a general purpose programmable digital computer to accomplish a useful result is encompassed within the definition of patentable subject matter as set forth in Sections 100(b) and 101 of Title 35 of the United States Code and as developed through the decisions of this Court, the purposes of this Brief as *amicus curiae* are:

(1) To urge the Court to hold that electrical method claims are proper subject matter for patents under 35 U.S.C. 100(b) and 101 and in compliance with the rule of *Cochrane* v. *Deener*, 94 U.S. 780, when the claims recite the performance of method or process steps on electrical signals, whether continuous or discrete, to produce a specific useful result, provided all other requirements for patentability are met;

(2) To urge the Court to hold that patentability cannot be negated by a presumed difficulty of searching or classification of prior art; and

(3) To urge that any limitations on the existing right of inventors to patent electrical method claims carried out on computers be left to legislative action by Congress.

QUESTION PRESENTED.

Whether a patent claim drawn to a method of transforming and manipulating signals according to recited steps and sequence to produce a desired useful result which would normally come within the purview of 35 U.S.C. 100(b) and 101 is rendered unpatentable subject matter merely because the method is capable of being carried out on a programmed general purpose digital computer and does not contain limitations to use in a particular field of technology other than data processing by machine.

SUMMARY OF ARGUMENT.

I.

Embodying a new and unobvious concept in a series of steps performed in a machine, such as a programmable general purpose digital computer, wherein electrical signals are transformed through machine operation to produce a desired useful result is clearly patentable subject matter under the provisions of 35 U.S.C. 101, as modified by Section 100(b) of 35 U.S.C. wherein Congress enlarged on the definition of the term "process" in its most recent enactment on the patent laws and defined a process "as including a new use of a known . . . machine". Thus, in the absence of any express prohibition by Congress removing a digital computer from the definition of "machine" in Section 100(b) or Section 101 of 35 U.S.C., there is no statutory basis for holding that

electrical processes performed in a machine of the digital computer type are *per se* unpatentable subject matter.

The decisions of this Court uniformly hold that a fundamental truth or elemental principle when left alone does not achieve or produce a desired useful result and is therefore unpatentable, but when that elemental truth or principle is applied and controlled to produce a useful result, patentable subject matter does exist. See *O'Reilly* v. *Morse*, 56 U.S. (15 How.) 62; *The Telephone Cases*, 126 U.S. 1; *Corning, et al* v. *Burden*, 56 U.S. (15 How.) 252; *Cochrane* v. *Deener*, 94 U.S. 780; *Tilghman* v. *Proctor*, 102 U.S. 707; and *Funk Bros. Seed Corp.* v. *Kalo Company*, 333 U.S. 127 at 130. A factual analysis of the claims must be made for each case. The decisive factor in each case is whether an elemental principle *per se* is being claimed or whether the patent claims the application thereof in accordance with a prescribed mode to produce the desired useful results.

Therefore, when (as in the case now before the Court), a claim requires embodying a concept in physical-electrical form and requires the stepwise control, transformation and transmission thereof while in the form of electrical signals through a computer mechanism so as to produce a technological useful result, there is no basis for the objection that only a mental step or fundamental truth is being claimed, and the claim defines patentable subject matter fully in accordance with the present patent laws and the controlling decisions of this Court.

II.

There is no basis in law for treating process inventions involving digital computer manipulation of electrical signals any differently than other electrical process inventions, since the Patent Office has routinely granted patents for performing operations on electrical signals to produce a useful result as exemplified by *Ex Parte Hathaway*, 47 U.S.P.Q. 393, in accordance with *The Telephone Cases*, 126 U.S. 1. Further, a process for controlling digital electrical signals has already been held patentable by this Court, see *O'Reilly* v. *Morse*, 56 U.S. (15 How.) 62.

III.

The proposal by the Patent Office that an alleged unpatentable process claim for controlling electrical signals in a digital computer could be made patentable simply by restricting the process to use in a particular narrow field of technology, such as in an "electronic telephone switching system", is improper and has nothing whatsoever to do with the patentability of a process invention which in its broad form already satisfies requirements of the patent statutes. As pointed out by the Court in *The Telephone Cases, supra,* and in *Cochrane* v. *Deener*, 94 U.S. 780, a process is not limited to a particular apparatus.

IV.

The Patent Office's concern with the possibility that judicial approval of electrical process claims carried out in a general purpose digital computer machine might further increase its burden of classifying prior art and

examining patent applications appears to ignore the fact that much of the presumed difficulty will have to be performed by the Patent Office regardless of the approval or denial of claims for processing electrical signals in a digital computer, because the electrical processing art would have to be classified and examined in the course of examining such digital computer concepts when claimed in combination with a subsidiary art which the Patent Office concedes would comprise patentable subject matter. Moreover, there already exists in the Patent Office prior art classification system, a specific class and subclass of the type at issue in the present case. See Class 340, Subclass 347, "Code Converter (i.e., Rapid to Slow, Digital to Binary)". The existence of any Patent Office manpower or financial problems relating to a newly developing technological art, such as the field of digital computers and the use thereof, should be solved by Congressional action rather than attempting to have the Court interpret the patent statutes in a restrictive manner.

V.

Since novelty and non-obviousness have been conceded below, it is improper to raise these issues before this Court or to attempt to have the case decided on the basis of non-compliance with 35 U.S.C. 103.

ARGUMENT.

I.

PROCESSES UTILIZING BASIC PRINCIPLES ARE PATENTABLE SUBJECT MATTER EVEN THOUGH FUNDAMENTAL TRUTHS PER SE ARE NOT PATENTABLE.

A.

Section 101 of Title 35, United States code provides:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Section 100(b), Title 35, United States Code provides the definition for a process:

> The term "process" means process, art or method, and includes a new use of a known process, machine, manufacture, composition of matter, or material.

The four separate and distinct classes of invention set forth in 35 U.S.C. 101 grew out of developments of the case law, on a case-by-case basis as sciences and the useful arts grew. The Constitution of the United States in Article I, Section 8, Clause 8, uses only the term "science and useful arts", and the four statutory classes of invention in U.S.C. 101 were not spelled out in the early Patent Acts. However, in subsequent patent acts the term "process" was used to further clarify "useful arts", and in the most recent Congressional pronouncement on the Patent Laws (July 19, 1952) Congress enlarged on the

definition of the term "process" by stating in 35 U.S.C. 100(b):

> The term "process" means process, art or method, and includes *a new use of a known* process, *machine*, manufacture, composition of matter, or material. (Emphasis added)

Thus, in accordance with the most recent patent legislation a process claim which involves or inherently requires using an old or known machine, such as a general purpose digital computer, in a new (and unobvious) manner to produce a useful result is patentable subject matter and should be patentable in the absence of some express prohibition or the exclusion of a general purpose digital computer from the definition of "machine".

B.

One of the concerns of the courts in construing claims for process inventions under the early patent acts was that a patent could not be granted for an abstract "idea" or a mere "principle", and it is this prohibition which the Government proposes is determinative of the question in this case. The proper meaning of the words "process", "principle" and "idea" has given the courts, as well as patent practitioners and the Government in this case, considerable trouble. Some light was shed at an early date by Justice Story in his *Notes on the Patent Laws*, reported in Vol. 3 U.S. Supreme Court Reports (3 Wheat.) Note II, Appendix, P. 13, at 15:

> A patent cannot be for a mere principle, properly so-called; that is, for an elemetary truth. But the word principle is often used in a more lax sense, to signify constituent parts, peculiar structure, or process; and in specifications it is generally used in

this latter sense; and in this view, it may well be the subject of a patent.

The patent laws and the courts have wrestled as each new art or technology developed over the last 200 years with the fine line between an unpatentable "elementary truth" or "law of nature" on the one hand, and a patentable process claiming a practical application of that truth or law which performs certain functions via matter or energy in a prescribed manner and produces a useful result. The ultimate dividing line has always been the production of useful results—i.e. the requirement of utility in the technological arts.

Whereas, Ampere's discovery of the relationship between electric current (I), voltage (V) and resistance (R) defined by the equation $V = IR$, would not be proper subject matter for a patent, because it is an elementary truth or principle, a useful application of Ampere's principle could be patented. Thus, the process of transmitting vocal sounds through a wire to a remote location utilizing that basic truth was patentable; and analysis of the principal claim construed and held valid by this Court in *The Telephone Cases*, 126 U.S. 1 is helpful in determining what is patentable subject matter here. The claim held valid is repeated below:

> 5. The method of, and apparatus for, transmitting vocal or other sounds telegraphically, as herein described, by causing electrical undulations, similar in form to the vibrations of the air accompanying the said vocal or other sounds, substantially as set forth.

Bell had discovered that speech could be transmitted by gradually changing the intensity of a continuous electric current passing through a conductor, to make the

variations in intensity of the current correspond to the changes in density of the air caused by the sound of the voice. He also devised apparatus for accomplishing these changes of intensity so that speech could actually be transmitted. As stated by Chief Justice Waite:

> In this art—or, what is the same thing under the Patent Law, this process, this way of transmitting speech—electricity, one of the forces of nature, is employed; but electricity left to itself, will not do what is wanted. The art consists in so controlling the force as to make it accomplish the purpose. . . . (126 U.S. 532).

> ***for it is only useful arts—arts which can be used to advantage—that can be the subject of a patent. (126 U.S. 533).

Thus, Bell was allowed process patent claims for the transmission of speech by varying the intensity of electrical current and without apparatus limitations. He did this either by varying the voltage (at the terminal of the battery) or by varying the resistance, thereby making use of the elementary truth—Ampere's law.

As in *The Telephone Case* (*Ibid*), it is also true in the present case that the mathematical equation or concepts by themselves would not accomplish the useful result desired, and that the desired result is accomplished only when the mathematical concepts are embodied and controlled in physical-electrical form in a computer mechanism.

The demarcation between an elementary truth and the application of that truth or principle to perform useful functions and produce useful results is also drawn whenever a patent is issued for a machine, realizing that

Newton's laws of motion *per se* could not be patented. Similarly, Einstein's definition of the relationship between mass and energy is a fundamental fact or elementary truth that could not be patented, but the first technological application of that truth for a useful purpose in controlling the chain reaction of a pile of radioactive material in a nuclear reactor to produce a useful result (namely heat) was patentable (See U. S. Patent 2,708,655, issued December 19, 1944).

The prohibition against patenting a phenomenon of nature was again expressed by Justice Douglas in *Funk Bros. Seed Company* v. *Kalo Company*, 333 U.S. 127, wherein it was stated that the law will not recognize a patent for a phenomenon of nature, but the Court again acknowledged that a patentable invention comes from "the application of the law of nature to a new and useful end." (333 U.S. at 130)

C.

In basic method patents one fundametal consideration always raised is: do the claims in fact call for an elementary truth, principle or law of nature, or do the claims call for an application of an elementary truth, principle or law of nature to a new and useful end. The question can only be resolved by study and analysis of the invention actually claimed. Only after this determination can a judgment be made as to whether the patentee is claiming merely an elementary truth or the application of an elementary truth to a new and useful end.

This process of factually examining the claim is not indigenous to electrical signal processing claims of the type in question here; rather, it extends to all of the

branches of technology. If, in the case of the nuclear reactor, both the first heat-producing, controllable pile of fissionable material and Einstein's law of nature had come out of the same series of experiments, developments, or discoveries, the inventor or discoverer would surely have been entitled to claim as his invention the reactor and the method of operating the reactor, even though the principle or law of nature (i.e. Einstein's law) could not be patented. The validity of his patent would depend upon what was actually claimed as the invention, and it would not be negated if properly claimed merely because it was based upon an elementary law of nature of the most fundamental type.

This Court has decided the question of patentability of broad process claims in a new technology by analyzing in detail the specific invention claimed to determine whether merely an abstract principle or a useful application is being claimed. The early case of *O'Reilly, et al v. Morse, et al*, 56 U.S. (15 How.) 62, dealt with the invention of the telegraph by Samuel Morse. While one claim, namely Claim 8, was held invalid, all the others were held to be valid. Claim 8 is repeated below:

> Eighth. I do not propose to limit myself to the specific machinery or parts of machinery described in the foregoing specification and claims; the essence of my invention being the use of the mode of power of the electric or galvanic current, which I call electromagnetism, however, developed, for marking or printing intelligible characters, signs or letters, at any distances, being a new application of that power of which I claim to be the first inventor or discoverer. 56 U.S. at 112.

The Court, in analyzing this claim, stated that Morse was trying to claim the exclusive right to the use of electric current whenever and however it resulted in the marking or printing of intelligible characters, signs or letters at a distance. Relative to this claim, the Court concluded:

> In fine, he claims an exclusive right to use a manner and process which he has not described and indeed had not invented, and therefore could not describe when he obtained his patent. The Court is of opinion that the claim is too broad, and not warranted by law. 56 U.S. at 113.

All the remaining claims of the Morse patent were upheld. The valid sixth claim of the Morse patent was directed to the art consisting of marking signs, composed of dots, spaces and horizontal lines susceptible of being combined into combinations to represent numerals, words and sentences, by closing and breaking an electric circuit rapidly for telegraphing, 56 U.S. at 101. The signals thus produced were digital signals, similar to the ones used in digital computers, and to be distinguished from the continuous but varying signals used by Bell for the telephone. The Court rested its decision on an analysis of the leading English case of *Neilson, et al* v. *Harford, et al*, in the English Court of Exchequer. Neilson had developed a system for preheating air prior to introducing it into a furnace. The air was drawn in by a blower and forced through a heated receptacle and thence into the furnace for combustion. The principle involved in the invention was that hot air will promote the ignition of fuel better than cold air, and it was embodied in Neilson's machine. He had claimed as his invention the new method,

irrespective of any particular shape of the receptacle. In discussing and approving the decision, the Court stated:

> And hence it seems that the Court at first doubted, whether it was a patent for anything more than the discovery that hot air could promote the ignition of fuel better than cold. And if this had been the construction, the Court, it appears, would have held his patent to be void; because the discovery of a principle in natural philosophy or physical science, is not patentable.
>
> But after much consideration, it was finally decided that this principle must be regarded as well known, and that the plaintiff had invented a mechanical mode of applying it to furnaces; and that his invention consisted in interposing a heated receptacle, between the blower and the furnace, and by this means, heating the air after it left the blower and before it was thrown into the fire. Whoever, therefore, used his method of throwing hot air into the furnace, used the process he invented, and thereby infringed his patent, although the form of the receptable or the mechanical arrangements for heating it, might be different from those described in the patent. 56 U.S. at 117.

The case of *O'Reilly* v. *Morse* was interpreted and approved in *The Telephone Cases*, 126 U.S. at 534:

> The effect of that decision was, therefore, that the use of magnetism as a mode of power without regard to the particular process with which it was connected to the patent, could not be claimed, but that its use in that connection could.

In the case of *Corning, et al* v. *Burden*, 56 U.S. 252, this Court reversed a lower court's holding that the plaintiff's patent was for a process, rather than for a machine. In discussing the distinctions, the Court makes some illuminating remarks:

> A process, *eo nomine*, is not the subject of a patent in our Act of Congress. It is included under the general term "useful art" . . . But where the result or effect is produced by chemical action, by the operation or application of some element or power of nature, or by one substance to another, such modes, methods or operations, are called processes. . . . One may discover a new and useful improvement in the process of tanning, dying, etc., irrespective of any particular form of machinery or mechanical device. . . . It is when the term "process" is used to represent the means or *method of producing a result* that it is patentable, and that it will include all method or means which are not effected by mechanism or mechanical combinations. 56 U.S. at 267. (emphasis added).

The next important case in the line of Supreme Court cases developing the law of patentable methods or processes is *Cochrane* v. *Deener*, 94 U.S. 780. The *Cochrane* case has been recognized as a leading case in defining a patentable process. The Statement most often quoted is found at 94 U.S. 788:

> A process is a mode of treatment of certain materials to produce a given result. It is an act, or a series of acts, performed upon the subject-matter to be transformed and reduced to a different state or thing. If new and useful, it is just as patentable as is a piece of machinery. In the language of the Patent Law, it is an art. . . . The process requires that certain things should be done with certain substances, and in a certain order; but the tools to be used in doing this may be of a secondary consequence.

While this statement of the Court was considered to be an expansion of the earlier decisions regarding a

patentable process so as to include mechanical as well as chemical processes and rendering the thing patented independent of the machinery or apparatus which carried out the invention, the *Cochrane* decision gives a generally accepted definition of a patentable process in which there are three principle requirements. First, the *mode* of treatment (i.e. processing steps) must be specified. Secondly, the act or series of acts which comprise the mode of treatment must transform the matter acted upon and reduce it "to a different state or thing." Finally, and probably most importantly in the present context, the process must "produce a given result" which, if new and useful, distinguishes patentable subject matter from unpatentable subject matter.

At the time of the *Cochrane* decision, electrical signal processing techniques were unheard of, of course. But, since electricity is a form of "matter" and has mass differing only in degree from that of a strip of metal or stream of chemicals, the *Cochrane* Court's definition of "process" clearly encompasses a process of transforming electrical signals into a different form or state so as to produce a given useful result. There are many examples found in present day technology wherein an electrical signal is modulated with information which can be a voice signal or a television signal, and the modulated signal then detected and the useful information recovered. Many such processes are considered patentable subject matter within the definition of Section 101.

It should also be observed that appellant, in its petition for Certiorari laid primary stress on the *Cochrane* case for the definition of a process (see pages 10 and

11); whereas the *Cochrane* case is not even included in the thirty cases cited in its Brief on the merits. It becomes apparent that the petitioner is now asking for a new, more restrictive definition for what constitutes a patentable process under 35 U.S.C. 100(b) and 101—something which would obviously be best left for legislation.

Following the *Cochrane* case came *Tilghman* v. *Proctor*, 102 U.S. 707, which related to a method claim for manufacturing fat acids and glycerine from fatty bodies by the action of water at a high temperature and pressure. The Court approved the reasoning in the *Cochrane* case and further explains a patentable process at 102 U.S. 722,

> That a patent can be granted for a process, there can be no doubt. *The patent law is not confined to new machines and new composition of matter, but extends to any new and useful art or manufacture.* A manufacturing process is clearly an art, within the meaning of the law.
>
> It seems to us that this clear and exacting summary of the law affords the key to almost every case that can arise. "Whoever discovers that a *certain useful result can be produced* in any art by the use of certain means is entitled to a patent for it, provided he specifies the means." But everything turns on the force and meaning of the word "means". It is very certain that the means need not be a machine or an apparatus; it may, as the Court says, be a *process*. A machine is a thing, a process is an act or a mode of acting. The one is visible to the eye; an object of perpetual observation. The other is a concept of the mind, seen only by its effects when being executed or performed. 102 U.S. 728. (Emphasis added).

II.

PROCESS INVENTIONS INVOLVING PROGRAMMED COMPUTERS SHOULD BE TREATED NO DIFFERENTLY THAN OTHER ELECTRICAL PROCESS INVENTIONS.

In accordance with the holdings in the above Supreme Court cases, including those in *Cochrane* v. *Deener, supra,* and *The Telephone Cases, supra,* the practice of presenting process claims before the Patent Office has developed, particularly in electrical inventions wherein the invention is directed to performing specific steps on electrical signals to produce useful results. The practice was well established even in 1940, as indicated in the case of *Ex Parte Hathaway*, 47 U.S.P.Q. 393 (Patent Office Board of Appeals, 1940) wherein the claim in question is reproduced below.

> A method of measuring the frequency of an electric wave comprising the steps of distorting said wave into a flat-topped wave having a wave front substantially independent of the shape of the original wave, deriving a peaked impulse from each front of said flat-topped wave, rectifying said impulses, and integrating said rectified impulses into an average current proportional to the frequency of said wave and measuring said average current.

The Examiner had rejected the above claim as not covering a proper method, stating that each of the five steps called for in the claim necessarily requires the use of apparatus and that the applicant could be equally well protected by an apparatus claim as well as by a method claim. In upholding the method claim, the Patent Office Board of Appeals stated:

> It may be true that in a situation of this nature, there is no real need for method claims and that a more uniform practice and fewer difficulties in han-

> dling applications would result if apparatus claims only were presented. We think, however, that *thousands of method claims have been allowed in electrical cases in similar circumstances* and that many of these claims have been held valid by the courts. 47 U.S.P.Q. at 393 (Emphasis added).

Since the time of the *Hathaway* case, particularly in the period following World War II and because of the advances in the electronic arts during World War II, the number of electrical patents has increased substantially; and the practice of including electrical method or process claims is as prevalent today as it was in 1940. This practice has not been questioned seriously either in the Patent Office or in the courts. The Patent Office Board of Appeals in the *Hathaway* case was merely following the cases discussed herein decided by the Supreme Court in allowing process claims for manipulating an electric current or a signal impulse.

The difference between the signal processing claim of the above *Hathaway* case and the claims of the present appeal as construed by the lower court is not such as would require the Patent Office or this Court to rule that the appealed claims do not comprise patentable subject matter. Thus, the claims of the present appeal call for the processing and transformation of digital signals, rather than analog signals of the type used in the *Hathaway* case or by Bell in the invention

of the telephone. However, claims directed to electrical signal processing for discrete or "digital" signals[1] rather than continuous or "analog" signals date back before *The Telephone Cases* (October, 1887) to *O'Reilly v. Morse,* (December, 1853), because the dots and dashes transmitted by Morse were in fact digital signals, the difference between a dot and a dash being determined by the length of time when continuity was established at the transmitting end and carried through conductors with the same signal being recovered at the output or receiving end. In modern digital computers, the digital signals are stored in memory elements, transformed by the arithmetic or logic section of the machine, and recovered at the output as different signals representative of useful results.

Before the advent of the digital computer, the processing of information represented by either analog or digital signals was consistently treated as statutory subject matter. In addition to telephone and telegraph signals, there were facsimile, television, dial pulse and hookswitch signals controlling relay circuits in telephone exchanges, and many others. Data processing, *per se,* is not new. What is new is the extremely high speed and general purpose character of modern data processing machines—that, and the extensive use of programmed

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(1) An analog signal is one in which the amplitude or intensity represents the information (e.g., 2 volts means 2 miles per hour). A digital signal is one in which all the signals have the same amplitude, but the number of signals and their ordering carries the information. Common mechanical examples include analog clocks (the position of the hand represents time) and digital clocks (the actual numbers are displayed).

control. The apparatus and control mechanism do not change the nature of the job, which is no more than machine processing of signals.

In a manner of speaking, science has closed the loop —back to the time of Samuel Morse and the transmission of digital signals representative of signs or other markings. As stated by Justice Grier in his separate Opinion in *O'Reilly, et al* v. *Morse, et al*, dissenting only on the judgment of the Court on the question of costs, but concurring as to claims held valid:

> He who first discovers that an element or law of nature can be made operative for the production of some valuable result, some new art, or the improvement of some known art; who has devised the machinery or process to make it operative, and introduce it in a practical form to the knowledge of mankind, is a discoverer and inventor of the highest class. . . .
>
> The mere discovery of a new element or law or principle of nature, without any application of it to the arts, is not the subject of a patent. But he who takes this new element or power, as yet useless, from the laboratory or the philosopher, and makes it the servant of man, who applies it to the perfecting of a new and useful art, or to the improvement of one already known, is the benefactor to whom the patent law tenders its protection. 56 U.S. at 132.

From the above analysis of the Supreme Court cases relating to process inventions, it is clear that an invention should not be rendered unpatentable under 35 U.S.C. 100(b) and 101 merely because the disclosure in an application is directed to processing signals in a digital computer or merely because the claims in a patent ap-

plication cover processing electrical signals in digital computers as well as analog embodiments of the invention, and provided that the claims meet the other rigorous requirements for patentability set forth in Title 35 of the United States Code.

III.

TO HAVE VALID METHOD CLAIMS FOR ELECTRICAL SIGNAL PROCESSING THE CLAIMS NEED NOT HAVE "SIGNIFICANT APPARATUS LIMITATIONS" AS URGED BY THE PATENT OFFICE.

The Patent Office in its brief concedes that claims indicating a particular field of art and having "significant apparatus limitations", thereby giving reasonable boundaries to the claimed invention, should be allowed citing *The Telephone Cases* as authority, (Petitioner's Brief, p. 23).

Petitioner then concludes that in *The Telephone Cases* "the Court noted that the applicants' claims were limited to the method they had devised as practiced with only two particular types of microphone and loudspeaker apparatus." This is a misleading statement. It is true that the Supreme Court limited infringement of the *apparatus* claims to the two particular embodiments of transducer disclosed; but the Court held the method claims to be independent of the use of any particular apparatus:

> The patent for the art does not necessarily involve a patent for the particular means employed for using it. Indeed, the mention of any means, in the specification or descriptive portion of the patent, is only necessary to show that the art can be used . . . (126 U.S. at 533)

After giving credit to the basic nature of Bell's invention, the Court concluded, "Surely a patent for such a discovery is not to be confined to the mere means he improvised to prove the reality of his conception." (126 U.S. at 539)

The Patent Office indicates that the claims on appeal are directed solely to the art of data processing and are in no way limited to some subsidiary or additional art; and that if they had been limited to a "stored-program-controlled electronic telephone switching system for converting dial signals into binary signals," a different question would be presented. (p. 28, last paragraph of Petitioner's Brief) However, there is no valid basis in law for saying that the restriction of *method* claims to a particular apparatus would render them patentable, because such a consideration is irrelevant under the requirements of the *Cochrane* case (Ibid.).

IV.

PATENTABILITY SHOULD NOT BE NEGATIVED BY THE PRESUMED DIFFICULTY OF SEARCHING OR CLASSIFICATION OF PRIOR ART.

Process inventions cover many useful technologies and procedure formerly performed only by man, such as the monitoring of the states of apparatus and reacting thereto to control the same, and such inventions have been implemented with automatic relay circuits, wired electronic logic circuits, a combination incorporating a programmed digital computer, and in many other ways. There has been no question but that these inventions are patentable subject matter, as represented by the many

classes and subclasses within the Patent Office classification system.[*]

To show that an adequate classification system does in fact exist and that it is not impossible to develop an adequate system, reference is made to the Patent Office Manual of Classification wherein at Class 340 (Electrical Communications) an entire Subclass (namely 347) is devoted to "Code Converters (e.g. Rapid to Slow, Decimal to Binary)". Such a Subclass would obviously include the present invention, as it is difficult to see how one could be more definitive of the claimed subject matter. The above classes and Subclasses include method as well as apparatus inventions.

The Patent Office's position is that without a greatly detailed classification system, patents will be granted that do not meet the exacting requirements of *Graham* v. *John Deere Co.*, 383 U.S. 1. However, the search system is only intended to establish the level of ordinary skill in the art, not to anticipate each and every claimed invention. An examiner does not have to show a method was known in all its detail in order to reject a patent under 35 U.S.C. 103. The remaining requirements of the *Deere* factual analysis do not require an immediate detailed classification of computer programs.

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[*] The Patent Office has personnel in its Classification Branch whose only function and special expertise is to classify issued patents according to subject matter in the appropriate class and subclass. There are over a hundred major classes in the basic chemical, mechanical and electrical arts, and each class may be further divided into over one hundred subclasses. The classification and cross referencing of issued patents is one of the truly outstanding functions performed by the Patent Office.

If the Courts or Congress had succumbed to the restrictive position now taken by the Patent Office, there would have been no process patents providing adequate protection for the telegraph or the telephone inventions. Even more recently, there would have certainly been no patents in the field of nuclear reactors where, under law, all data was held in secrecy for years prior to its being available to the public.

V.

NOVELTY AND NON-OBVIOUSNESS NOT IN ISSUE.

The petitioner at several places in its brief includes arguments concerning obviousness or level of invention. These arguments relate to 35 U.S.C. 103, and are not properly at issue in this review on petition.

The opinion of the Court below states as the last paragraph of the section entitled "The Invention":

> "As to these claims, no prior art is cited and no question is raised as to utility, novelty, or unobviousness. The asserted advantages and the implicit advance resulting therefrom in the data-processing art have not been questioned."

The petitioner also acknowledges in footnote 19, page 20, that non-obviousness is not an issue here. Nevertheless, its brief includes numerous comments such as whether, the principle "synergizes with the computer or cooperates with it in some new and unconventional way that makes for invention." (pages 16 and 26); "Without novel and unconventional cooperation • • •" (page 26); "• • • would raise it to the level of a patentable 'invention' or 'discovery'." (page 27)

Since the issue raised below relates only to the question of patentable subject matter under 35 U.S.C. 100(b) and 101, any question as to novelty or unobviousness should not be considered here because of the incompleteness of the record.

CONCLUSION.

Any judgment of this Court should not hold that machine processing of a signal in a programmable general purpose digital computer is *per se* unpatentable subject matter.

Respectfully submitted,

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In The

Supreme Court of the United States

October Term, 1971

ROBERT GOTTSCHALK, Acting Commissioner of Patents,

Petitioner,

vs.

GARY R. BENSON and ARTHUR C. TABBOT,

Respondents.

On Writ Of Certiorari To The United States Court Of Customs And Patent Appeals

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BRIEF FOR IOWA STATE UNIVERSITY RESEARCH FOUNDATION, INC., AS AMICUS CURIAE

AUTHORITY TO FILE.

This Brief as *amicus curiae* in support of respondent is filed pursuant to Rule 42-2 of the Supreme Court. The letters of consent from the Petitioner and the Respondent are on file with the Clerk of the Court.

INTEREST OF AMICUS CURIAE.

Iowa State University Research Foundation, Inc. of Ames, Iowa, (hereinafter the "Research Foundation") is a not-for-profit Corporation organized under the laws of the State of Iowa for the purpose of encouraging research and education at Iowa State University.

Since 1938, the Research Foundation has encouraged research and education by granting monies derived from patent licenses based on inventions of Iowa State University faculty members. Revenue from licensing is used to support further research. Over the past 34 years, over 2.6 Million Dollars derived from the Research Foundation from patent licenses has been used to support educational research. The Research Foundation was the financial underwriter of the first computation center at Iowa State University, using funds derived from licensing of inventions assigned to it by faculty members.

Faculty members at Iowa State are not required to assign inventions to the University or the Research Foundation; however, experience has shown that the vast majority choose voluntarily to assign their inventions to the Research Foundation which is better suited to develop the inventions. Each inventor receives a portion of the net royalty income when his patent is licensed.

Iowa State University conducts computer research for both hardware and software in the Departments of Computer Science and Electrical Engineering. A large number of the over 850 members of the Graduate Faculty engaged in research in a wide variety of disciplines (i.e., the physical and biological sciences, engineering, agriculture, veterinary medicine, home economics, the humanities and education) make substantial use of computer programming in their research.

Many of the resulting computer programs are developed to meet specific requirements by those working on the frontiers of knowledge in their specialized fields of research. These programs may often be the only possible way of reducing truly new and useful discoveries to practical utility or of simulating complex systems for study and analysis.

The Research Foundation has a long-standing and deep interest in the Patent Laws as a means of developing inventions, deriving revenue to support educational research and rewarding the results of beneficial and effective research.

The Research Foundation believes that its views on some of the issues raised in the Government's Brief will aid this Court in applying the law to the facts in the present case and in placing these issues in a broader factual perspective than was presented by the Government. In view of its rather unique position as a large and established university-connected research foundation, the Research Foundation also believes that it has a perspective different than respondent.

The Research Foundation has particular interest in filing this Brief to represent not only its own interests but those of a unique group of educators and researchers —namely, independent scientists who spend part of their time in teaching and part of their time in research which is a necessary involvement for educators in the field of science and technology.

The Research Foundation has no concern with the private interests of any party to this litigation.

STATEMENT OF PURPOSE.

As seen by the Research Foundation, the issue before the Court is broader than the narrow issue proposed in the Government's Brief; rather, the issue relates to the propriety of using method or process claims in patent applications in which the invention is directed to a mode or method of processing electrical signals to transform them and produce useful results, such as data. Such inventions relate to communications, control, analysis and simulation. The Government takes the position that if such claims cover programmed digital computers, they are directed to subject matter which is unpatentable under Sections 100(b) and 101 of Title 35, United States Code; but any differences between a programmed general purpose data processor, a specially wired digital computing machine or an analog computer are merely academic when one considers the functions, operation and useful results produced by each.

The purpose of the present Brief is to urge the Court to hold that properly drafted method claims covering machine techniques for processing electrical signals which provide useful results are not rendered unpatentable subject matter under 35 U.S.C. 100(b) and 101 merely because they cover all equivalent steps of an inventive process to provide a useful result. All of the other requirements for the granting of a patent must also be fulfilled, including novelty, meeting the test of unobviousness set forth in *Graham* v. *John Deere & Co.*, 338 U.S. 1, the giving of a complete and adequate disclosure and clear and concise claiming as required in 35 U.S.C. 112, and so on.

ARGUMENT.

A.

METHOD OR PROCESS PATENT CLAIMS ARE INTENDED TO COVER INVENTIONS WHERE THE PRACTICE OF THE INVENTION IS INDEPENDENT OF THE USE OF ANY PARTICULAR APPARATUS.

The Patent Office does not object to the granting of patents on a system wherein a digital computer forms one element of the system, even a very important element. For example, U. S. patent 3,484,560 of Jaeger, et al, entitled "Equipment for Serving Customer-Dialed Calls Including Those Requiring Operator Assistance" issued December 16, 1969, employs a programmable digital computer as a principal element in a complex system for providing operator and other services in a telephone switching network. The Patent Office Board of Appeals was reversed in the case of *In Re Prater and Wei*, 415 F. 2d 1393 (CCPA 1969) which held that claims covering *apparatus* for analyzing spectographic data were directed to patentable subject matter within the meaning of 35 U.S.C. 100(b) and 101, even though the claims read on a programmable digital computer as well as the analog apparatus actually disclosed. The Patent Office did not petition for Certiorari before this Court after the decision in the *Prater* case. In the present case, the Patent Office objects to *process* or *method* claims which are broad enough to read on a method performed in a programmed digital computer.

A large, modern computer facility, such as the one at Iowa State University, has a capability normally much beyond the minimum requirements that would be included in a commercialized invention involving a programmable computer. The data processing, comparing, data gather-

ing, etc. in a commercial version of an invention would be done on a computer which would be designed more specifically to the task than is the large, more general purpose computer available at a typical computation center. Nevertheless, the same invention may equally well be practiced on either a fixed program digital computer, a more specifically designed programmable computer or a larger, more general purpose programmable computer. It is this particular type of invention for which process claims are ideally suited. That is, the mode of treatment of the data signals is independent of the apparatus on which the processing is carried out.

As this Court stated in *Cochrane* v. *Deener*, 94 U.S. 780, which dealt with both method and apparatus patents for manufacturing flour:

> That a process may be patentable, irrespective of the particular form of the instrumentalities used, cannot be disputed. If one of the steps of a process be that a certain substance is to be reduced to a powder, it may not be at all material what instrument or machinery is used to effect that object, whether a hammer, a pestle and mortar or mill. Either may be pointed out; but if the patent is not confined to that particular tool or machine, the use of the others would be an infringement, the general process being the same. . . . The machine pointed out as suitable to perform the process may or may not be new or patentable; while the process itself may be altogether new, and produce an entirely new result. The process requires that certain things should be done with certain substances, and in a certain order; but the tools to be used in doing this may be of secondary consequence. (94 U.S. at 787, 788).

From the above, it is apparent that one of the underlying reasons for classifying inventions into the different statutory classes of machine and process is to inform

the public as to what may or may not be done. Thus, the building of a machine cannot infringe a process claim for use of the machine, and likewise, the carrying out of a process by hand or in the mind avoids a claim covering only a machine or apparatus for practicing the process.

It is sometimes difficult to determine whether an invention resides in the machine or in the process, as the two may be almost inseparable. Further, the scope of machine or process claims may be substantially different, as indicated in *The Telephone Cases*, 126 U.S. 1, wherein it was stated:

> The patent for the art does not necessarily involve a patent for the particular means employed for using it. Indeed, the mention of any means, in the specification or descriptive portion of the patent, is only necessary to show that the art can be used; . . . Thus, an art—a process—which is useful is as much the subject of a patent, as a machine, manufacture, or composition of matter. (126 U.S. at 533).

There are other decisions of this Court which similarly hold that a process claim is independent of the particular apparatus through which it is practiced. *Corning* v. *Burden*, 56 U.S. 252, *Tilghman* v. *Proctor*, 102 U.S. 707, *New Process Fermentation Co.* v. *Maus*, 122 U.S. 413.

Relating the decisions of these cases to the present facts, if an electrical signal processing method meets the requirements of the Patent Laws and would be infringed by a system which includes as one element an analog computer, then the same method patent must be infringed if a special-purpose, non-programmable digital computer performing equivalent functions of the analog computer in the process is substituted for it. Similarly, a process claim would have to be infringed through the use of a

special-purpose, but programmable digital computer if it performed all of the functions or steps called for in the method claim. The position of the Government in the present case would require that the claim not be infringed by a more general purpose, programmable digital computer. Hence, the Government's position in this appeal if brought to its logical conclusion, would mean that method claims for data processing inventions could be infringed by certain machines, but not others.

It is submitted that the Court must hold that method claims directed to electrical signal processing methods are proper when the practice of the method is independent of the use of any particular apparatus, and secondly, that a method claim which is otherwise statutory, is not rendered unpatentable for covering non-statutory subject matter under 35 U.S.C. 100(b) and 101, merely because the claim is broad enough to read on the operation of a general purpose programmable digital computer, provided that the claim also does not exclude performance of the method in the mind of a human being. The performance of a method in the mind of a human being, for example, a method of computation, is believed to come outside the definition of a patentable process given in the *Cochrane* case, *supra* because the subject matter operated on is not *transformed* in a manner which can be detected. The changing or transformation of electrical signals in a general purpose, programmable digital computer may, of course, easily be detected.

B.

THE PATENT SYSTEM IS THE ONLY MEANS BY WHICH A UNIVERSITY RESEARCHER CAN BE REWARDED FOR A MERITORIOUS INVENTION.

When an invention is developed or a discovery is made in industry, the inventor or owner generally has the choice

of maintaining it in secrecy and possibly continuing his hold on the invention in perpetuity, or he may apply for a patent and obtain a limited monopoly in return for a full disclosure. This choice is particularly characteristic of the computer programming industry. For example, a very large computer program (called APT) for controlling three- and five-axes automatically programmed machine tools is kept in secrecy and available only to those who pay an annual fee. Such fees are used to improve and maintain the program, but the benefits of many years of research and development is not available to the public, and may never be.

A university researcher, on the other hand, is in a position similar to a medical researcher or a legal scholar. He must publish the results of his research as a means of prompting further investigation and to achieve recognition in his field. Were it not for the patent system, these publications would deprive the researcher as well as the university of a just reward for public benefit resulting from their work. Publication, not secrecy, should be encouraged, and strong Patent Laws are the best way to encourage a complete public disclosure.

C.

THE COPYRIGHT LAWS DO NOT AFFORD COMMENSURATE PROTECTION FOR INVENTIONS INVOLVING DIGITAL COMPUTERS WHEN A PATENTABLE INVENTION IS INVOLVED.

It has been urged upon this Court that copyright protection is adequate for computer programs.[1] It is submitted that copyright protection is not adequate for de-

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[1] See Brief Amicus Curiae for Burroughs Corporation, P. 22, and Brief for Amicus Curiae International Business Machines Corporation, P. 30.

velopments involving digital computers when the contribution to the art rises to the level of unobviousness called for in 35 U.S.C. 103 and as analyzed in *Graham* v. *Deere*, 383 U.S. 1. Even though the Copyright Office Announcement of May 19, 1964, has indicated that the Copyright Office will consider registration for a computer program as a "book" in Class A, the announcement itself expresses misgivings as to whether computer programs are proper subject matter for copyright. Further, the only act that will infringe a copyright is a direct reproduction or duplication of the thing copyrighted. It is not the idea or contribution that is copyrighted, only the particular, narrow expression or form of that idea or contribution, as registered in the Copyright Office, *Peter Pan Fabrics, Inc.* v. *Martin Weiner Corp.*, 274 F. 2d 487 (2d Cir. 1960).

Where there is a public interest in facts being in the public domain as with scientific journals, business procedures, maps or compilations, courts have emphasized the actual appropriation of language in finding infringement, *Baker* v. *Selden*, 101 U.S. 99; *Holdridge* v. *Knight Publishing Corp.*, 214 F. Supp. 921 (S.D. Calif. 1963), and see *Yankwich*, "Legal Protection of Ideas, a Judge's Approach," 43 Va. L. Rev. 375 (1957).

The protection afforded under the Copyright Laws is particularly inadequate as a means of protecting the useful results of research for university faculty members due to the emphasis on publication in scientific and trade journals. Such a publication would contain the gist or "heart" of the actual advancement or contribution, it would not be a mere listing of particular program instructions, as would be included in a registration for copyright.

It should also be noted that there is serious doubt that the courts would uphold the copyrightability of a computer program when the expression of the program is a deck of punched cards or a magnetic tape. It may well result that copying directly of either of these media would not be an infringement of a copyright. This Court held in the case of *White-Smith Music Publishing Company* v. *Apollo Co.*, 209 U.S. 1, that short of special statutory protection, a copyright cannot be infringed unless the accused act results in the production of something tangible which can be observed by a human being so as to give "every person seeing it the idea created by the original", quoting from Bailey, J. in *West* v. *Francis*, 5 BARN & ALD. 743, 209 U.S. at 17. In the *White-Smith* case, the score for a musical composition in the form of sheet music had been copyrighted and the defendant implemented a coding of the music on a perforated roll designed to control a player piano. This was held not to constitute an infringement of the copyright.

Relating this to computer programs, it would therefore appear that the only true subject matter, short of a statutory revision, that could be properly copyrighted is a list of instructions printed so as to be intelligible to a human being. A person could then take that list and either encode it directly onto magnetic tape or punch a deck of cards to implement the corresponding machine code, without infringing the copyright.

D.

ONLY A SMALL PERCENTAGE OF ALL COMPUTER PROGRAMS, EVEN AT A UNIVERSITY COMPUTATION CENTER, ARE SERIOUSLY CONSIDERED FOR PATENTING.

The environment at a university places emphasis on conducting research as a means of maintaining and enhancing the skills of educators. There is further emphasis on the publication of research results in technical and

scientific journals. This is true of the computer sciences as well as for other fields of electrical engineering, physics, veterinary medicine, and so on.

Iowa State University has an extensive computation center, in terms both of staff and physical equipment. The general purpose digital computer has become an indispensable tool in conducting basic and applied research in all fields of science and applied technology. On a large, programmable, general purpose digital computer, problems can be analyzed which would require years of human computation. The digital computer has afforded a means of solving problems which heretofore were not even considered solvable. Further, physical systems, whether small or large, may be simulated on a digital computer so that new techniques for the solution of problems may be tried and analyzed even before physical hardware is designed.

Of all the large number of computer programs that are written at Iowa State University, only a very small number indeed is ever considered for possible patenting. Those programs which are directed to the solution of ordinary recordkeeping or computational problems are not considered as patentable because they do not rise to the level of invention called for in 35 U.S.C. 103, as interpreted by the courts.

However, occasions do arise in which a truly unique and inventive solution to a problem is conceived by an inventor, and is reduced to practice on a digital computer. Of the total research conducted employing the use of a computer at Iowa State University, it is estimated that less than one per cent is ever seriously considered for patenting. The question arises: should even this relatively small number of inventions be rendered unpatentable merely because they are reduced to practice

ugh the agency of a programmable general purpose tal computer? The answer must be "no" when one iders that such inventions would otherwise have been lered patentable if the inventor had designed and built pecial purpose digital computer or a functionally valent analog computer to implement the solution to problem.

CONCLUSION.

n invention which is independent of the apparatus which it is performed and which contemplates the use general purpose programmable digital computer ld be held to come within the statutory definition patentable process.

ere are substantial policy considerations, including eed to afford adequate reward for meritorious inven- and the desirability of fostering complete and ade- disclosure to the public, for including computer- ed method or process inventions in the statutory es of invention under 35 U.S.C. 100 (b) and 101. For reasons, it is respectfully submitted that the deci- of the Court below should be upheld.

Respectfully submitted,

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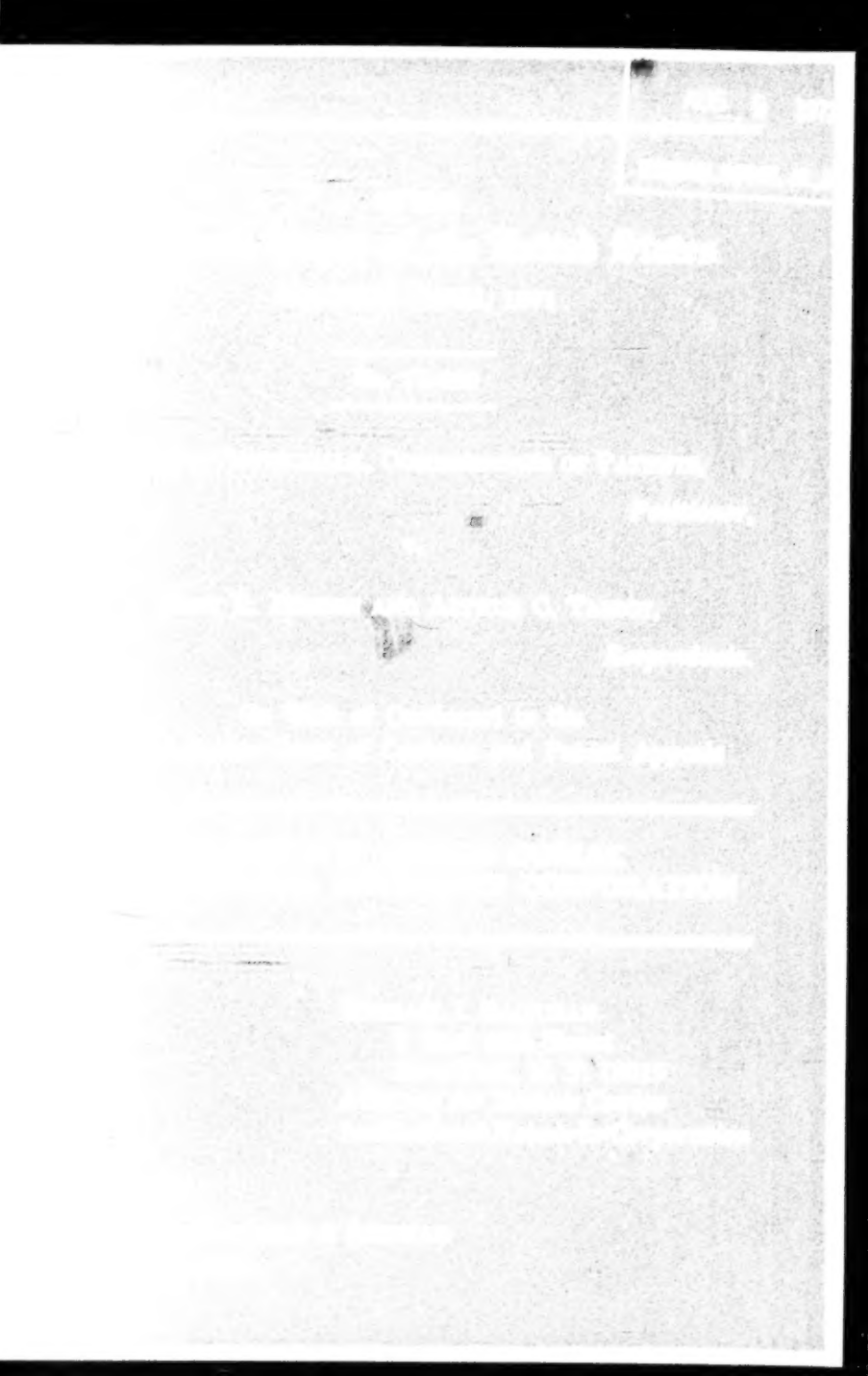

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IN THE

Supreme Court of the United States

October Term, 1971

No. 71-485

ROBERT GOTTSCHALK, COMMISSIONER OF PATENTS,

Petitioner,

v.

GARY R. BENSON AND ARTHUR C. TABBOT,

Respondents.

On Writ of Certiorari to the
United States Court of Customs and Patent Appeals

BRIEF FOR AMICUS CURIAE INSTITUTIONAL NETWORKS CORPORATION

Institutional Networks Corporation ("Instinet") submits this brief *amicus curiae* with the written consent of both parties to the case. The letters of consent have been filed with the Clerk of the Court.

QUESTION PRESENTED

Under the Constitutionally-based definition of patentable subject matter in the Patent Act, is there any basis for distinguishing between a method of numerical conversion carried out by an electronic machine having a fixed control sequence (a type of machine sequence traditionally recognized as being within the statutory classes of invention) and the same method carried out by a computer having a programmed control sequence?

INTEREST OF AMICUS CURIAE

Instinet furnishes a service which allows institutional investors to buy and sell stocks automatically and anonymously. To this end, all subscribing institutions are provided with television-type displays and keyboards which are connected over leased telephone lines to a shared central computer. A substantial portion of Instinet's investment is embodied in its communication system, its terminal designs and the programming of its computer, and certain aspects of the Instinet system are disclosed and claimed in its U.S. Patent No. 3,573,747. If in the present case the Court establishes that patent protection for any invention involving programming is precluded as a matter of law, then the validity of Instinet's patent may be jeopardized and Instinet may be at a competitive disadvantage relative to larger companies who will be in a position to copy its invention and offer the same service.

CONSTITUTIONAL AND STATUTORY PROVISIONS INVOLVED

Article I, Section 8, Clause 8, of the Constitution of the United States provides:

> The Congress shall have Power . . .
>
> • • • • •
>
> To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries.

35 U.S.C. § 100(b) provides:

> The term "process" means process, art or method, and includes a new use of a known process, machine, manufacture, composition of matter, or material.

35 U.S.C. § 101 provides:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

INTRODUCTION AND SUMMARY

The "questions presented" by the petitioner and the *amici* which support its position are limited to the patentability of a method, under programmed control, for converting numerical information from one form to another. But their briefs deal with the much broader question of whether computer programming methods in general are patentable. The record before the Court is incomplete with respect to the nature of computers and programs, and it is respectfully urged that even should this Court rule in favor of petitioner, the holding should not be extended to the much broader issue which has improperly materialized. Of necessity, however, we will direct our argument to both the narrow and the broad issues.

A fixed control machine is one whose basic method of operation cannot be varied without making wiring changes or replacing parts.

A programmed control machine (a general-purpose computer) is one whose basic method of operation can be

varied without making wiring changes or replacing parts; but to vary its basic method of operation still requires that numerous physical changes be made. That is because a general-purpose computer is a machine having a very large number of component parts which, prior to the machine's being programmed, do not cooperate with each other to produce any useful result. In order to apply the machine to some useful end, it must be programmed. The programming of a computer causes physical changes in the individual parts, and a new inter-relationship to be formed among them. By programming a computer, the user creates a new machine.

There is no dispute that methods of operating machines under fixed control are patentable, even if the methods are based upon mathematical relationships. Because methods of operating machines under fixed and programmed control are fundamentally the same, the latter should be entitled to the same protection.

A written list of program instructions is not in itself patentable subject matter; it is no more than a blueprint for a machine. But, like the machine, a *programmed computer* is patentable if the general requirements for patentability are satisfied because it is a new "machine", a machine with a new arrangement of parts which is physically different from all other machines. That new machine is in a class of subject matter which is indisputably statutory subject matter under 35 U.S.C. § 101. And a new method of operating a machine under programmed control is patentable under 35 U.S.C. §§ 100(b) and 101 because it is a new "process".

ARGUMENT

I.

A METHOD OF OPERATING AN ELECTRONIC MACHINE IS THE SAME WHETHER THE METHOD IS UNDER FIXED OR PROGRAMMED CONTROL.

There is no dispute that apparatus for, and methods of, operating machines under fixed control are statutory subject matter, and indeed hundreds of thousands of patents have been issued therefor. Any argument that execution of a machine method under programmed control should not be patentable, as opposed to execution of the same machine method under fixed control, is in error because it necessarily misconceives the true nature of the single invention which is common to both of the embodiments.

The true nature of a machine process invention (under fixed or programmed control) is best appreciated by reference to a hypothetical example which is not clouded by "mathematical" considerations.[1] Assume that a textile manufacturer has developed a new fabric having numerous admirable qualities, but which is so delicate that there is no known way to wash it in a washing machine without tearing it. Assume further that an inventor has discovered a machine process for safely washing the fabric. That process entails a specific and novel sequence of steps including rinsing, spinning, drying, etc., each of which is carried out within a specified temperature and time range.

There are two different ways to control the newly invented sequence of steps for operating the washing machine.

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[1] The irrelevance of "mathematics" as an issue before the Court will be considered in the following section.

One of these requires the mechanical modification of a conventional washing machine. Such a machine includes a set of cams which slowly rotate after the machine is turned on. Each cam has notches in it which operate respective electrical switches as the cam rotates. When a switch is operated, it causes a specific operation to take place (e.g., drying at 100° Fahrenheit). The length of time during which each switch is operated depends upon the length of a notch in the respective cam. Depending on the type of fabric to be washed, a different set of cams can be brought into play by appropriately setting a control knob on the machine. What is required to implement the new machine process is to provide an additional set of cams which can be called upon when the new fabric is to be washed. This type of machine process control is of a "fixed" nature. Although the operator can choose from among different sets of cams, all of the sets are built into the machine, and no machine sequences other than the fixed ones can take place.

The second way to implement the new machine process (along with the old washing cycles) is to use a computer. Instead of providing *any* fixed sets of cams (old or new), a small computer could be programmed to operate the various electrical switches at appropriate times. A different program would control the wash cycle for each different type of fabric. In this case, the new machine process (as well as the old ones) would be under "programmed control".

In determining which of the two implementations of the hypothetical machine process should be patentable, attention should be focused on the underlying invention, that is, what is the new "useful art" under Article 1, Section 8 of the Constitution. The invention is not providing a new set of cams for the conventional washing machine, or appro-

priately programming a computer to control the running of a washing machine in the new way. Rather, it is the new sequence of steps in the washing cycle of the machine—a classical example of a patentable process. *Cochrane* v. *Deener*, 94 U.S. 780 (1876).

What the petitioner seeks from this Court is a ruling to the effect that the Patent Statute recognizes a difference in *how* the machine process is implemented, that is, whether the steps in the washing cycle are governed by fixed or programmed controls. There is no logic in that, nor is there any basis for such a distinction in the Constitution or the Patent Statute. The same requirements for patentability—including those dealing with obviousness as established by this Court in *Graham* v. *John Deere Co.*, 383 U.S. 1 (1965)—should apply to any machine process, regardless of how it is implemented.

When the specific invention of respondents Benson and Tabbot is considered, an initial reaction might be that it is more "mathematical" in nature than washing machine cycles. The role of mathematics in this and similar cases will therefore now be discussed.

II.

THAT AN ELECTRONIC SYSTEM (COMPUTER OR NON-COMPUTER) MAY BE BASED ON MATHEMATICAL RELATIONSHIPS IS IRRELEVANT TO THE ISSUE BEFORE THE COURT.

A. That Any Otherwise Patentable Method Is Based On A Mathematical Relationship Does Not Render It Unpatentable

Thousands of patents have issued on inventions which are based on mathematical relationships. Yet this has never given rise to any serious question concerning patentability. For example, the odometer or mileage indicator in every car "counts" the number of miles travelled. It has never been seriously suggested that this device is non-statutory subject matter.

The use of mathematics pervades present-day technology. Mathematics is so essential to the design of electronic systems that a special algebra has been extensively developed just for this purpose. Indeed, this Court has recognized that "[w]hile a scientific truth or the mathematical expression of it is not patentable invention, a novel and useful structure created with the aid of knowledge of scientific truth may be". *MacKay Radio & Telegraph Co.* v. *Radio Corporation of America*, 306 U.S. 86, 94 (1939).

All of the briefs submitted in support of the petitioner rely on this Court's decision in *Funk Bros. Seed Co.* v. *Kalo Inoculant Co.*, 333 U.S. 127 (1948), for the proposition that a principle or law of nature may not be monopolized. However, the decision in *Funk Brothers* found a lack of patentable invention not because the claimed inoculant was predicated on a law of nature, but rather because the *only*

thing which the inventors did was to discover this law of nature. In *Great A.&P. Tea Co.* v. *Supermarket Equipment Corp.*, 340 U.S. 147 (1950), this Court held that an aggregation, whose whole did not exceed the sum of its parts and which did not provide an unusual result, could not be patented. See also, *Anderson's-Black Rock, Inc.* v. *Pavement Salvage Co.*, 396 U.S. 57 (1969). All the Court held in *Funk Brothers* was that the multiple-strain bacteria inoculant which was in suit was an "aggregation of species [which] fell short of invention within the meaning of the patent statutes". *Id.* at 131. All species in the inoculant had the same individual effects they always had and their use together did not improve in any way their natural functioning. The inoculant patent was held invalid not because the invention was predicated on the discovery that different strains of bacteria were compatible, but rather because the implementation of that discovery was not a patentable "combination".

For an invention to be patentable under *Funk Brothers, A.&P.*, and *Anderson's-Black Rock*, its elements or steps must cooperate in such a way that the whole exceeds the sum of the parts. A machine process invention which includes a series of disjointed and unrelated steps cannot be patented. But a machine process invention whose steps, in combination, cooperate to produce a new result, certainly is within the ambit of statutory subject matter, whether or not the process is based on a scientific or mathematical discovery.

Any patent application which claims a mathematical formula per se should properly be rejected. But the same treatment should not be accorded to a novel *machine process* which happens to be based on mathematical relationships.

Otherwise, patents would not be granted on adding machines, odometers, electric utility meters and a host of present-day more sophisticated products, such as radar and lasers.

B. That the Benson and Tabbot Invention Is Based on a Mathematical Relationship Does Not Render It Unpatentable

The Benson and Tabbot invention as claimed is not a mathematical formula; instead, it is a machine process which is based on a mathematical relationship. Moreover, this machine process can be performed by mechanical equipment such as cams and gears (admittedly statutory subject matter) no less accurately that it can be under programmed control.

Consider the situation in an industrial plant, for example, in which a machine monitors an assembly line and generates electrical signals which represent parameters such as the speed of a conveyor belt, the opening and closing of certain valves, etc. The electrical signals are generated in a particular order and all of the electrical signals must be transmitted to a control room. But the control room is designed to receive electrical signals in a completely different form. What is required is an intermediate machine, and a method of operating it, for converting the generated signals to the form acceptable by the control room.[2] The method must comprise a series of steps, based on a mathematical relationship, to develop one set of electrical signals from another.

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[2] Converters of the type invented by Benson and Tabbot are highly practical and widely used in applications of the type under discussion.

The Benson and Tabbot invention is just such a machine method for converting electrical signals from one form to another.[3] Their method can be implemented under fixed control, much as an odometer converts the number of rotations of a tire to the rotations of gears in a mileage indicator, or it can be implemented under programmed control. Mathematics is as irrelevant to the patentability of the programmed control embodiment as it is (and would be considered by the Patent Office to be) to the patentability of the fixed control embodiment.

III.

A NEWLY PROGRAMMED COMPUTER IS A NEW MACHINE AND IS THEREFORE STATUTORY SUBJECT MATTER.

A written sequence of program instructions is *not* patentable; it is only a writing.[4]

What *is* patentable is the new machine which exists *after a program is stored in a computer*, and the method of operation of that new machine, i.e., the sequence of steps which it performs.

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[3] Any machine process under programmed control entails operations upon electrical input signals and the generation of electrical output signals. Computers operate only upon electrical signals even though for descriptive purposes references may be made to number representations.

[4] While copyright protection is theoretically available for such a writing, this form of protection is of little value because copyright only protects the copying of the writing itself. Copyright is wholly inadequate to protect the method of operation of a programmed machine. See *Baker* v. *Selden*, 101 U.S. 99 (1879). In any event, the availability of other forms of protection for programmable inventions is irrelevant to the issue before the Court.

When a program is first stored in a computer, what happens is that hundreds, thousands, or often even hundreds of thousands of minute component elements in the machine are *physically* changed. Once they are so changed, a new sequence of operation of the machine is established. A new sequence results because there is a *new combination* or arrangement of elements, even though the individual elements are all old. This Court has repeatedly recognized that a new arrangement of old elements, i.e., a new combination, is statutory subject matter:

> ". . . As is usual in combination patents, none of the elements in either of these patents were themselves patentable at the time of the patent, nor are they now. . . . The patents were warranted not by the novelty of their elements but by the novelty of the combination they represented. Invention was recognized because Laitram's assignors combined ordinary elements in an extraordinary way—a novel union of old means was designed to achieve new ends. Thus, for both inventions 'the whole in some way exceed[ed] the sum of its parts.' Great A&P Tea Co. v. Supermarket Equipment Corp., 340 U.S. 147, 152 (1950)." *Deepsouth Packing Co.* v. *Laitram Corp.*, —U.S.—, —, 32 L. Ed.2d 273, 277 (1972.)

The programming of a digital computer similarly results in a new combination to achieve a new end. This engineering fact should be dispositive of the broadened issue which has appeared in this case.[6]

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[6] How the storing of a program in a computer creates a new machine, and the equivalence of machine processes under fixed and programmed controls, are demonstrated in a much more rigorous manner in the Appendix hereto.

IV.

EVEN IF A PROGRAMMED COMPUTER IS CONSIDERED TO BE A NEW USE OF AN OLD MACHINE, THAT IS NOT A BAR TO PATENTABILITY.

On pages 12-13 of its Brief, the petitioner says the following about the Benson and Tabbot invention:

> ". . . No new machinery or hardware is necessary to complete the series of logical or mathematical steps described. The mathematical procedures recited in the claims can be carried out in existing computers long in use; . . ."

But "new machinery" is not a prerequisite of patentability. Almost all electronic systems are combinations of the same basic building blocks. What is required for patentability in almost every case is a *new combination* of building blocks, not new building blocks per se. And when

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[1] (Continued)

That the programming of a computer results in a new machine combination has been recognized by the C.C.P.A., *Application of Bernhart*, 417 F.2d 1395, 1400 (1969). It has also been recognized by the Commissioner of Patents:

> "A programable machine, such as a general purpose computer, with its various parts not interconnected to perform any useful combined operation is merely a 'warehouse' of unrelated parts. It may well be that the same machine, with a program device correctly related thereto, may yield a novel and useful machine combination due to the new interrelation of parts. In other words, the fact that such a prior art machine can have its parts interrelated by a program device in a new way to carry out machine functions of a specialized character may well result in a new patentable combination, unless there is a prior art teaching that would make the interrelations and results thereof obvious." Guidelines of August 2, 1966, 829 Official Gazette 1.

The facts on which this policy of the Commissioner was based have not changed.

a designer causes a digital computer to be programmed in a new way, he places numerous building blocks in a new combination which is no less a patentable combination than is any other system.

Furthermore, while the method claimed in the Benson and Tabbot application could have been carried out in a computer which existed at the time the invention was made, that could have been so only if numerous component elements in that computer were rearranged and placed in a new combination. A general-purpose digital computer is a very fast and flexible machine, but it is wholly dependent on its input instructions. It can do nothing without being told (programmed). Every single step, down to the most trivial detail, must be specified. A computer which existed at the time the Benson and Tabbot invention was made could have carried out the steps of the Benson and Tabbot method *only* if its basic building blocks were arranged in the proper combination. There was no such computer because Benson and Tabbot were the first ones to devise their particular machine process and cause a machine's building blocks to be appropriately arranged to carry out the method. It cannot be suggested seriously that any prior art computer could have performed the method of Benson and Tabbot without knowledge of their invention.

But even without considering the fact that the programming of a digital computer results in a new machine, petitioner's position is still incorrect. Even if all that a programmer invents is a new use of an old machine (implied by petitioner's argument that the Benson and Tabbot procedures could have been carried out in existing computers), the mere fact that the computer could have been made effective to carry out the process is not a bar to patentability.

> "If the mere fact that a prior device might be made effective for the carrying on of a particular process were sufficient to anticipate such process, the absurd result would follow that, if the process consisted merely of manipulation, it would be anticipated by the mere possession of a pair of hands." *Carnegie Steel Co.* v. *Cambria Iron Co.*, 185 U.S. 403, 425 (1902).

In any event, 35 U.S.C. § 100 defines the term "process" as including "a new use of a known . . . machine", and Section 101 states that "[w]hoever invents or discovers any new and useful process, . . . may obtain a patent therefor, . . ." Clearly, it was the Congressional intent to extend protection to the inventor of a new use of an old machine.

The claims in issue define a method of operating a machine, i.e., a digital computer. The machine process is new, and before the inventors' discovery existing machines could not practice it. Benson and Tabbot taught how to physically change an existing machine, i.e., how to rearrange its parts, so that it could practice a new machine process. They found a new use of that machine and they are entitled to a patent for their invention.

V.

THE TWO WAYS OF IMPLEMENTING A MACHINE PROCESS ARE TECHNOLOGICALLY INTERCHANGEABLE AND ARE BECOMING INDISTINGUISHABLE IN PRACTICE; IT IS IMPOSSIBLE TO MAKE A MEANINGFUL LEGAL AND PRACTICAL DISTINCTION BETWEEN THEM.

A "computer program" (or "software"), which is simply a list of instructions, is not patentable. The broadened question before the Court is whether a *programmed* general-purpose computer ("hardware"), i.e., a machine *whose parts are newly rearranged and combined so that it performs a new and novel machine process*, is patentable subject matter,[6] protectible by either conventional apparatus or method claims.[7]

It is important to understand how many electronic systems are designed in the first place. Suppose, for example, that it is desired to build or modify a washing machine to wash delicate fabrics as described above. After the basic machine process is conceived, there are two different approaches which can be taken. In one, a special-purpose con-

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[6] In general, most programmable "inventions" will not be patentable because of obviousness under 35 U.S.C. § 103—a fact conceded by even the most ardent proponents of protection for programmable machine process inventions. However, despite the petitioner's argument that the Benson and Tabbot "theorem follows automatically from the definitions of pure binary, decimal, and BCD numbers . . ." (Petitioner's Brief, p. 15), obviousness is not an issue before the Court in this case.

[7] The arguments in the briefs of the petitioner and its supporters, insofar as they pertain to alternative forms of protection (both existing and contemplated), foreign law and alleged Patent Office search difficulties (despite the fact that numerous "software" patents have been issued), are not relevant to the issue of whether a particular type of invention is embraced by the Patent Statute.

trol mechanism is built which can do only the tasks conceived by the designer. In the washing machine example, this control mechanism would consist of specially shaped cams which would determine the rinse, spin, etc. sequence, and the temperature and time interval ranges. Unfortunately, after such a mechanism is built, it is often found that the machine process does not work precisely enough and the mechanism must be redesigned.

In the other approach, a general-purpose digital computer is used; the computer is programmed so that it controls precisely the same steps as the special-purpose mechanism. One great advantage of using the computer is that it takes considerably less time to devise the necessary program, and, if it does not work with sufficient precision, it is a relatively simple matter to change the program. But in both cases it is the same machine process which is implemented. Often, the inventor pursues both the hardware and software approaches in order to determine which is best.

Operating Systems Survey, 1971, published by Auerbach Publishers, a leading source of data processing reports, gives several examples of the equivalence of hardware and software, from the standpoint of engineering design, and the manner in which particular functions can be accomplished under either fixed or programmed control:

> ". . . In several systems designed primarily for real-time processing (e.g., the XDS Sigma 2/5/7, IBM 1800), this scheduling function is performed by the system *hardware*. Other systems require a *software* scheduling routine to provide this function in lieu of the hardware capability." *Id.* at 96. (Emphasis added.)

> "When storage is divided into pages . . ., the program loading function may consist of simply loading all of the required main storage pages, or it may entail preparing the system for a process called paging. . . . In many systems this . . . is accomplished through *hardware* circuitry. In others, it must be accomplished via *software*." *Id.* at 102-103. (Emphasis added.)

The critical issue should always be whether a combination of steps performed by a machine is obvious, not which type of machine (a programmed computer or a special-purpose fixed mechanism) controls those steps.

While the various briefs have drawn a sharp distinction between hardware and software, the dividing line is not really clear. The engineering profession is coming to

> ". . . view a whole system as a coherent hierarchy of concepts in which there is no one broad line separating software from hardware. . . ." [8]

If the Court attempts to distinguish between hardware and software in allocating patent protection, it must first find that elusive line.

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[8] *Computer*, March/April 1972, page 17, published by The Computer Society of the Institute of Electrical and Electronic Engineers.

VI.

PERHAPS THE COURT SHOULD REQUIRE AN EXPLICIT MACHINE LIMITATION IN CLAIM 13.

The implementation of the machine processes discussed herein requires the sequential execution of multiple instructions. However, little has been said about any individual instruction. But an individual instruction is worthy of consideration because it is really a self-contained program.

A typical instruction might be to add the number contained in one memory location to the number contained in a second memory location, and to store the sum in a third memory location. A computer which executes an "add" instruction of this type is performing a machine process under programmed control.

Yet thousands of patents have been issued by the Patent Office on computers and the individual instruction processes which they perform under programmed control. Most of these patents are owned by the computer companies which have aligned themselves with the Patent Office in this case. Surely, neither the Patent Office nor the machine manufacturers would argue that all machine processes under programmed control should not be patentable, because that would necessarily invalidate thousands of the manufacturers' own "hardware" patents. Yet the single-instruction machine process is no less "mathematical" or "mental" in character than a machine process which requires the execution of several instructions in sequence.

The more limited single-instruction machine process is conceded by all concerned to be statutory subject matter—

provided that it is *claimed* as being performed by a machine. Anything that a computer can do can be done (more slowly) by a human being. But that does not preclude protection if the process claims are limited to performance by or on machines.

Processes, such as that of Benson and Tabbot, which require the sequential execution of multiple instructions are no more and no less statutory, provided that such processes are also limited to performance by machines. Claim 13 before the Court does not explicitly recite that its defined method is to be carried out on a computer. Instead, claim 13 defines operations on "number representations". However, the court below held[9] the claim to be limited to use of the method on a digital computer because the only "practical value" of the method is when it is practiced by a machine.

While this reasoning is sound, perhaps there is some merit in requiring an explicit recitation in the claim to limit the practice of the process to a machine. For example, the preamble of the claim could be revised to state: "A method for use by a data processor to convert. . . ." While the Court may deem this kind of explicit limitation to be desirable, it need not and should not make the unnecessary finding that the numerical conversion method, when properly claimed to be practiced under the programmed control of a machine, is non-statutory subject matter.[10]

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[9] *Application of Benson & Tabbot*, 441 F.2d 682, 687 (1971).

[10] On pages 7-9 of the Brief submitted by *amicus curiae* Honeywell, an explanation of the Pythagorean Theorem is presented together with a claim which defines "the method of determining the hypotenuse of a triangle". The question is asked whether "a novel set of instructions for the mathematical manipulation of Pythagoras' equation . . . is susceptible to patenting".

CONCLUSION

A machine process has long been recognized as statutory subject matter. Until as recently as perhaps twenty-five years ago, a new machine process could be implemented only by building a machine expressly for controlling that process. The same is still true. While it may be easier to program a computer than to build an entire new machine, when that computer is programmed it becomes a new machine by virtue of the *physical* changes which take place in it and the rearrangement of its parts, and it can perform only that process determined by its programmed control. A programmed computer is thus in the same statutory class

---

[10] (Continued)
It is difficult to consider this example objectively because all of us have probably used the theorem, and it appears absurd to allow anyone to monopolize any application of such a basic principle. But if the example is to be considered, we must try to assume that the theorem was not known and has just been discovered.
Despite the brilliance of the discovery, its use should be capable of only limited monopolization. Suppose the discoverer builds a machine which allows two dials to be set so as to represent the lengths of the two sides of a triangle, whereupon the machine prints out the length of the hypotenuse. This is precisely the kind of electronic instrument which has long been protectible and on which untold thousands of patents have been granted. See e.g., the Appendix. The hypotenuse-determining machine is clearly based on a mathematical relationship, but if it is not an obvious design—because the theorem has only just been discovered—there is no reason to deny protection on the machine and the method which it practices.
However, the Honeywell hypothetical claim (Honeywell Brief, p. 9) is not explicitly limited to the *machine* practice of the claimed method. If a machine-practice limitation is not impliedly read into the claim, it should be rejected. But if an appropriate limitation is expressly included in the claim, it should be allowable. If such a claim were to be found non-statutory, most electronic patents would be invalid because they too are based on underlying mathematical relationships and the fact that these relationships were new would be irrelevant.

as any other machine, and the method of operating a machine under programmed control (i.e., the sequence of steps which it performs) is in the same statutory class as a method of operating a machine under fixed control. In every case, it is the machine process which should be scrutinized for novelty; whether that process is under fixed control or under programmed control should make no difference in law because it makes none in practice.[11]

As for mathematics, mathematical formulas are not patentable. But inventions which are based on mathematical relationships are susceptible of protection, as recognized by this Court. See, e.g., *MacKay Radio & Telegraph Co.* v. *Radio Corporation of America, supra.*

The hundreds of software companies in this country will be in no position to compete with the machine manufacturers if the latter are allowed to freely copy program inventions; in fact, the machine manufacturers conceivably could "give away" the program inventions of others to induce sales of their computers, just as they now freely distribute some of their own programs. A decision of this Court on the broad question before it will either give life to hundreds of small companies or it will add, in effect, a software monopoly to the hardware monopoly already enjoyed by the machine manufacturers. The question is whether a few select companies will be given a multi-billion dollar monopoly, as opposed to permitting numerous smaller companies to participate in the economic life of this country. This case presents the Court with an opportunity to ensure that the patent system fulfills two of its most significant goals—to stimulate scientific research and to foster competition.

---

[11] The reasons for selecting one approach rather than the other are nearly always economic.

Benson and Tabbot would have been given protection as a matter of course had they built a gear-and-cam machine for implementing the same machine process which they implemented on a computer. In requesting the denial of patent protection to Benson and Tabbot, petitioner seeks to penalize them for not having ignored the technological revolution of the past twenty-five years.

Instinet urges that the decision below be affirmed. But even if it is not, e.g., because of a possible deficiency in claim 13, the Court should not unnecessarily broaden its holding to deny protection to any other machine process under programmed control. To do so would prevent the patent system from reflecting technological reality.

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APPENDIX

A COMPARISON OF TWO ILLUSTRATIVE ELECTRONIC SYSTEMS DEMONSTRATES THE EQUIVALENCE OF CONCEDEDLY STATUTORY ELECTRONIC SYSTEMS AND ALLEGEDLY NON-STATUTORY PROGRAMMED COMPUTERS.

It is the purpose of this Appendix to demonstrate from a technological standpoint how totally illogical it would be to deny protection to machine processes under programmed control, while at the same time affording the traditional protection to the same machine processes under fixed control. Toward this end, two electronic systems will be considered. The first is a fixed control machine whose method of operation is based on a mathematical relationship. While it is not patentable because of "obviousness", it is in a class which is unquestionably subject to patent protection—as evidenced by thousands of patents which have been issued on comparable machines using the same building block elements. The second system is a programmed computer which utilizes no building blocks other than those used in the first system, and which performs the same method, in the same way. It will be evident that both systems are essentially the same, and that no rational distinction can be drawn between them.

In order that the example not be overly complicated, we have selected two simple systems, neither of which can be patented because of obviousness. But what is important is the class of subject matter which the example represents, not whether the two systems themselves are obvious.

The two electronic systems are shown together on the foldout page at the end of this Brief so that the two drawings can be in continuous view as the following description

is read. (The two systems are identical except for those elements shown in bold outlines.)

Before describing the two systems, it will be helpful to consider five basic building-block elements used in electronic systems:

(1) Magnetic core—a miniature doughnut-shaped magnet that is magnetized in one of two ways, i.e., clockwise or counter-clockwise. These two directions are conventionally represented by the two digits 1 and 0 of the binary number system.

(2) Flip-Flop—two transistors connected so that only one of them is turned on at any time (universally represented by the binary digits 1 and 0). The "state" of the flip-flop is switched from a 1 to a 0, or vice versa, by turning off the previously on transistor, and turning on the previously off transistor.

(3) Adder—a device having two sets of input conductors, the electrical signals on which represent two numbers, and one set of output conductors, the electrical signals on which represent the sum of the two input numbers.

(4) Counter—a device whose electrical outputs represent a number, the number being increased by 1 each time another electrical pulse is applied to its input.

(5) Decoder—a device which, for example, might have 4 outputs, with a different output being energized for each of 4 possible input signals.

The electronic system of FIG. 1 is designed to alternately add and subtract successive numbers. The four numbers

are stored in memory 20.[1] The memory can be thought of as a series of cubbyholes each having a number stored in it. Each storage location (cubbyhole) consists of eight magnetic cores, some magnetized in the clockwise direction and some magnetized in the counter-clockwise direction. As mentioned above, for the sake of convenience, the directions of magnetization are represented by the digit symbols 1 and 0 respectively, and each group of eight digits represents a "number". An "address" is associated with each storage location; for the system to retrieve a particular stored number, it must first identify the address of the storage location which contains that number. Memory 20 is shown as having four storage locations with respective addresses 1 through 4. For example, storage location 4 contains the binary number 11010101 (which is equivalent to the decimal number 213). Information is introduced into the memory by memory input unit 38. The input unit can be a keyboard, a magnetic or paper tape reader, etc. Whatever the form of the input unit, it functions to insert four binary numbers into four successive memory addresses. This is accomplished by physically changing the directions of magnetization of 32 magnetic cores.

At regular intervals, "clock" 26 emits successive timing pulses which are applied to the input of counter 24. (The counter and the other circuits are represented by boxes, as they have been in thousands of issued patents, since their inner workings are well known.) The counter develops electrical output signals which represent the number of

[1] As is the practice in filing patent applications on electronic systems, every block of equipment is identified by a reference numeral.

clock pulses applied to its input, i.e., it "counts" the pulses for the purpose of identifying successive memory addresses. Electrical signals corresponding to the number counted by the counter are applied to the input of decoder 22. Depending on which of the address identifying numbers 1 through 4 is represented in the counter, the decoder energizes one of its four output conductors to select a respective address or location in the memory. When a particular location has been selected, the number stored at that address is transmitted over cable 36 to one input of "arithmetic unit" 30. The operation of the arithmetic unit will be described below.

When the first clock pulse causes counter 24 to generate the number 1, the binary number 01011101 stored at address 1 in the memory is transferred over cable 36 to the arithmetic unit. The second clock pulse causes the counter to generate the number 2, and thus the binary number 01101111 stored at address 2 of the memory is transferred over cable 36 to the arithmetic unit. As four successive pulses are generated by the clock, the four successive numbers stored in the memory are sent over cable 36 to the arithmetic unit. (Of course, by the transfer of numbers is meant the transmission of coded electrical signals over cable 36.)

Register 32 is basically another storage location containing a binary number. It is connected via cable 34 to the second input of arithmetic unit 30.

The arithmetic unit is designed to perform a "mathematical" operation on the two numbers applied to its inputs —either addition or subtraction, depending upon which of

the two upper control terminals of the arithmetic unit is energized. Whenever the two numbers at the inputs of the arithmetic unit are added to or subtracted from each other, the resulting sum or difference is entered into register 32 and stored there for later use. This new sum or difference in the register will be used as the second input to the arithmetic unit when the next clock pulse is generated and another number stored in the memory is transferred over cable 36 to the first input of the arithmetic unit.

Clock pulses, in addition to being applied to the input of counter 24, are also applied to the input of flip-flop 28. The flop-flop has two outputs X and Y, and only one of them is energized at any one time. Each clock pulse switches the state of the flip-flop; the first clock pulse causes the flip-flop to energize its output X, the second clock pulse causes the flip-flop to energize its output Y, the third clock pulse causes the flip-flop to energize its output X once again, etc. The X output of the flip-flop is connected to the terminal of the arithmetic unit which controls addition. Therefore, each of the first and third clock pulses causes the arithmetic unit to function as an adder. The Y output of the flip-flop is connected to the terminal of the arithmetic unit which controls subtraction, and therefore each of the second and fourth clock pulses causes the arithmetic unit to function as a subtractor.

As an example of the operation of the system, it is convenient to consider numbers in decimal form (i.e., the ten-digit system in common use). Suppose that register 32 initially contains a 0, and that memory input unit 38 initially stores the decimal numbers 40, 11, 4 and 7 in respec-

tive memory addresses 1 through 4. When the first clock pulse is generated, the number 40 in address 1 of the memory is transferred to the arithmetic unit. The arithmetic unit adds the number 40 to the number 0 in register 32, and then stores the sum 40 in the register. When the second clock pulse is generated, the number 11 in address 2 of the memory is transferred to the arithmetic unit. The arithmetic unit now functions as a subtractor, and subtracts the number 11 from the number 40 which is now in the register. The resulting difference 29 is then stored in the register. The third clock pulse causes the number 4 in address 3 of the memory to be transferred to the arithmetic unit, which now functions as an adder again to add the number 4 to the number 29 contained in the register, and to store the sum 33 back in the register. The fourth and last clock pulse causes the number 7 in location 4 of the memory to be transferred to the arithmetic unit, which now functions to subtract the number 7 from the number 33 in the register, and to store the final difference 26 in the register.

After the fourth cycle of operation, the final "answer" 26 is contained in the register. At this time, the final number can be transferred to output unit 40 which, for example, might be a typewriter which types the number 26. The memory input unit 38 might then receive another set of four numbers for storage in the memory, following which the same sequence of operations takes place with the second "answer" ultimately being printed by output unit 40.

The system of FIG. 2 operates in much the same way, but it is different from the system of FIG. 1 in two respects. First, instead of each memory location containing only 8

magnetic cores, it contains 9 magnetic cores. The extra digit depicted (within the bold outline) in each "row" of the memory is a "code" digit which indicates whether the associated number in the same memory address is to be used in an addition operation or a subtraction operation. The code digit 0 represents an addition operation, and the code digit 1 represents a subtraction operation. The memory input unit, when it first stores in the memory the four numbers to be processed, also stores in each memory address in FIG. 2 one of the two codes 0 and 1, each of which indicates whether the respective associated number is to be added to or subtracted from the number contained in register 32.

It will be recalled that flip-flop 28 in the system of FIG. 1 functions to control alternate addition and subtraction operations. Because each number in the memory of FIG. 2 now has associated with it a code digit which represents the type of operation to be performed on that number, the flip-flop is no longer necessary. Instead, a second decoder 42 is employed. Whenever decoder 22 selects one of the four memory locations causing the 8-digit number stored in that location to be transferred over cable 36 to the arithmetic unit, the code digit in the same memory address is transferred over cable 44 to decoder 42. Decoder 42 has two outputs which are labelled 0 and 1. If the code digit 0 is transferred to the decoder, the decoder energizes its 0 output conductor which is connected to the add control terminal of the arithmetic unit. This causes the arithmetic unit to function as an adder. Conversely, when the code digit 1 is transferred to decoder 42, the decoder energizes

its 1 output conductor. This output, connected to the subtract control terminal of the arithmetic unit, when energized, causes the arithmetic unit to function as a subtractor.

Since the code digits at addresses 1 through 4 alternate (0, 1, 0, 1), it is apparent that the arithmetic unit functions alternately as an adder and as a subtractor, and that the system of FIG. 2 does precisely the same data processing operations as does the system of FIG. 1, leading to the same "answer" being printed by output unit 40 of FIG. 2.

The system of FIG. 1 typifies the kind of fixed control electronic system which is disclosed in hundreds of thousands of issued patents. It is unquestionably statutory subject matter.

The system of Fig. 2 is a general-purpose digital computer[3] after it has been programmed, that is, after 4 mag-

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[3] This can be confirmed by making reference to the following definition submitted by petitioner on pages 6-7 of its Brief. The added bracketed material in the following quotation demonstrates how the system of FIG. 2 satisfies the definition:

> The basic parts of a digital computer are its (1) input [memory input unit 38], (2) storage unit [memory 20 and register 32, since as described above the register may be nothing more than a fifth memory location], (3) arithmetic and logic unit [arithmetic unit 30], (4) control unit [clock 26, counter 24 and decoders 22 and 42], and (5) output [output unit 40]. Data and instructions are inserted into the computer at the input [8-bit data and 1-bit instructions are inserted into the computer by memory input unit 38]. The storage unit receives data, and holds it for subsequent use or retrieval [memory 20 is the storage unit which receives the data to be operated upon, and holds it for subsequent use when it is retrieved by the arithmetic unit]. The arithmetic and logic unit consists of various circuits for performing multiplication, division, and other arithmetical or logical operations [arithmetic unit 30 performs addition and subtraction operations]. The control unit includes the circuits that effect selection and retrieval of instructions from storage or

netic cores have been physically changed so that their magnetizations alternate in direction to give rise to a new combination. The system is in a statutory class because it utilizes *precisely the same elements* used in the unquestionably patentable type of electronic system shown in FIG. 1. Each memory address in the computer of FIG. 2 contains nine magnetic cores rather than eight, and it contains two decoders (22 and 42) rather than only one. But its basic building blocks are no different from those which for years have qualified for patent protection in system configurations. The system of FIG. 2 is the more flexible one because the user has the option of storing different codes in the memory (physically changing it) so that the sequence of operations can be varied.[3] But once a particular set of code digits is stored in the memory along with the numbers to be processed, the final system performs a machine process which is *identical* to that of the system of FIG. 1. Since the general-purpose digital computer of FIG.

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from outside the computer [the control unit elements select and retrieve 1-bit instructions in the memory], in proper sequence [the instructions are selected in the proper sequence because counter 24 identifies successively numbered memory locations], and the carrying out of each of the coded instructions by generation and application of proper signals to the appropriate units [the coded instructions are carried out by the application by decoder 42 of the proper signals to the two control inputs of the arithmetic unit].

[3] There are 16 different sequences of code digits which can be stored in the memory of FIG. 2, and thus the user can select any one of 16 sequences of operations to be performed, e.g., first-subtraction, second-subtraction, third-addition, and fourth-subtraction. A commercial computer, of course, has a much larger memory, longer code digit sequences, and can execute many different types of instructions. Nevertheless, the system of FIG. 2 is unquestionably a digital computer.

2, *after it is programmed* with 0 and 1 "instruction" code digits, does precisely the same thing as the conventional type of fixed control electronic system shown in FIG. 1, and in the same way, and with the same elements, there is certainly no valid or reasonable basis for one system (FIG. 1) to be considered statutory subject matter, and the other (FIG. 2) not.

FIG. 1

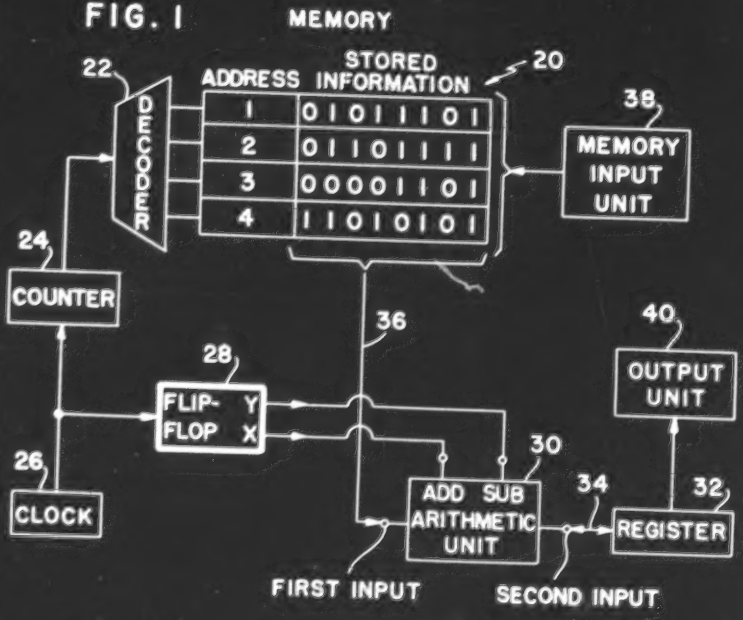
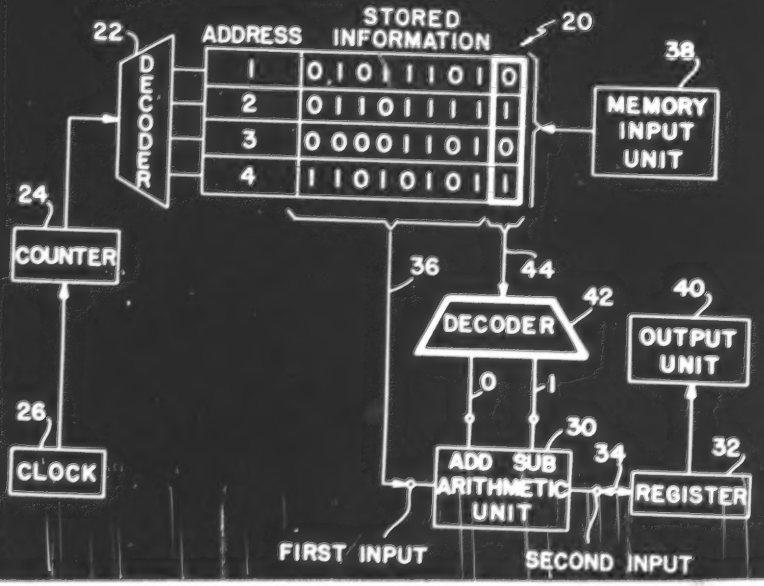

MEMORY
STORED
ADDRESS INFORMATION
20
22
DECODER
1 0 1 0 1 1 1 0
2 0 1 1 0 1 1 1 1
3 0 0 0 0 1 1 0 1
4 1 1 0 1 0 1 0 1
38
MEMORY
INPUT
UNIT
24
COUNTER
36
40
OUTPUT
UNIT
28
FLIP- Y
FLOP X
30
26
CLOCK
ADD SUB
ARITHMETIC
UNIT
34
32
REGISTER
FIRST INPUT
SECOND INPUT

FIG. 2


MEMORY
STORED
ADDRESS INFORMATION
20
22
DECODER
1 0 1 0 1 1 0 1 0
2 0 1 1 0 1 1 1 1
3 0 0 0 0 1 1 0 1 0
4 1 1 0 1 0 1 0 1 1
38
MEMORY
INPUT
UNIT
24
COUNTER
36
44
42
DECODER
40
OUTPUT
UNIT
0
1
26
CLOCK
30
ADD SUB
ARITHMETIC
UNIT
34
32
REGISTER
FIRST INPUT
SECOND INPUT

No. 71-485

AUG 8 1972

MICHAEL RODAK, JR., C

In the Supreme Court of the United States

OCTOBER TERM, 1971

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Petitioner,

vs.

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Respondents.

ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS

BRIEF FOR THE CHICAGO BAR ASSOCIATION AS AMICUS CURIAE

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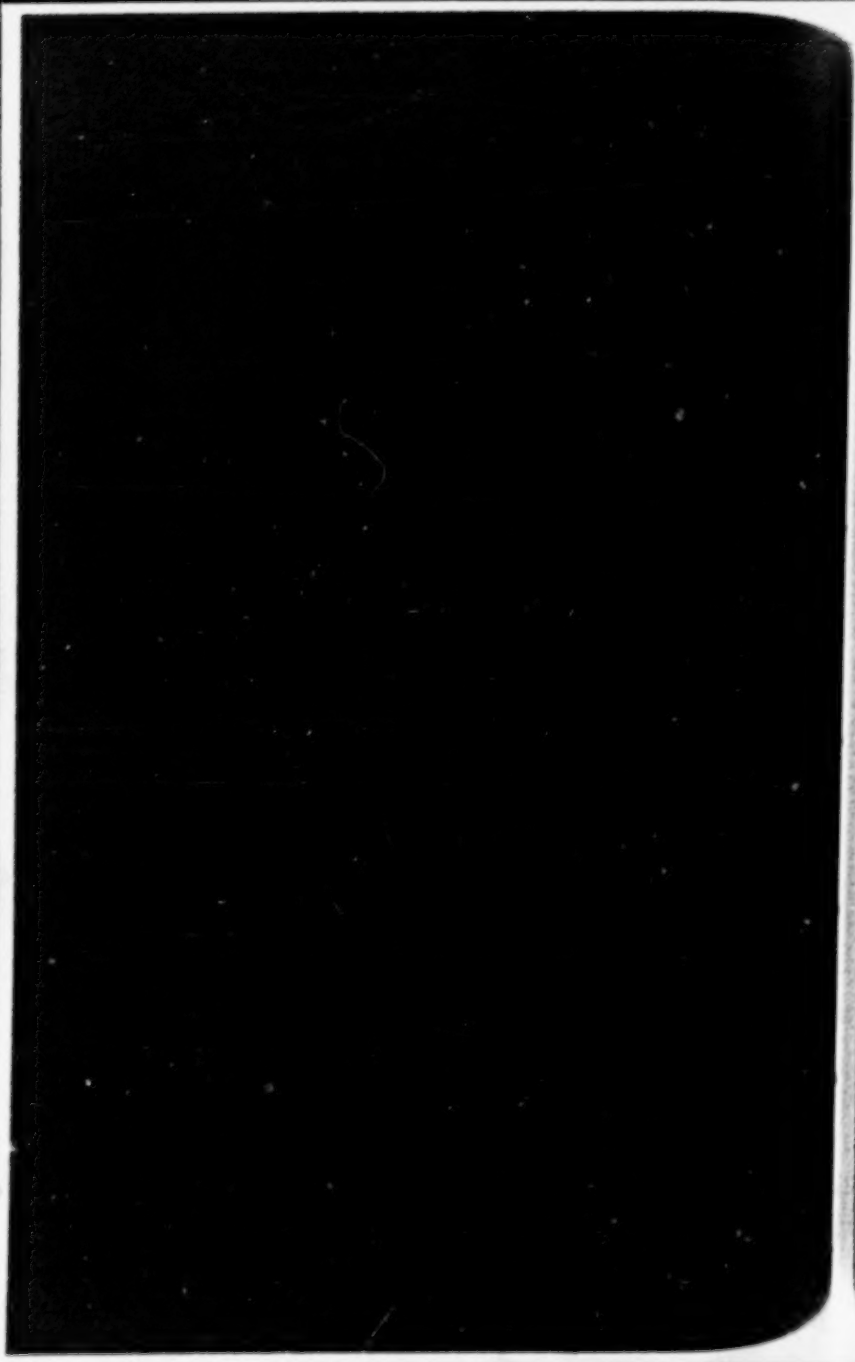

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Authority to File

This Brief as *amicus curiae* in support of respondent is filed pursuant to Rule 42-2 of the Supreme Court. The letters of consent from the Petitioner and the Respondent are on file with the Clerk of the Court.

Interest of The Chicago Bar Association

The Chicago Bar Association is an association of members of the Bar of the State of Illinois and either residing, practicing law or both in the Chicago area. The membership includes more than 10,000 lawyers of which about 400 are lawyers specializing in the law of patents, trademarks, copyright, or other closely related fields of the law. This brief is being filed on behalf of The Chicago Bar Association and was prepared and approved by its Patents, Trademarks and Trade Practices Committee after authorization of its Board of Managers. The Committee represents that the issues here involved concern the public interest and the Court is respectfully urged not to render any decision which would tend to remove the field of computer programming from the incentives for progress afforded by the patent system.

ARGUMENT

I. THE COURT SHOULD NOT LEGISLATE REMOVAL OF ONE CLASS OF PATENTABLE PROCESSES FROM THE PATENT SYSTEM MERELY BECAUSE OF ALLEGED PATENT OFFICE DIFFICULTIES.

This brief is especially opposed to contention II of the Appellant's argument reading:

> "II. Patentability of computer programming methods would tend to undermine the present patent system because the claims in this area can not be adequately classified and searched."

The mere statement of this contention seems to tacitly concede that there is nothing in the patent statute to exclude patenting a program which is a new and unobvious* process for operating a general purpose computer. It asks this Court to judicially legislate that area of invention out of the patent system solely on the basis of the stated policy considerations.

Even if the premises suggested were true, this would not so much be a reason for excluding the area from the patent system as for improving the ability of the Patent Office to operate in that area. If the Patent Office expertise and search facilities are less in this area than in others (which this brief does not concede) this deficiency would be reduced rapidly by increased experience alone as the Patent Office is forced to begin more normal and complete operations in the area.

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*No question of obviousness is believed properly before the court.

If it be assumed that possibly the Patent Office could never reach a level of operations as satisfactory as in other areas, this would surely be a matter for consideration by the Congress, with hearings for exploring the degree of present deficiency, the danger of its continuation and what remedies are available. Congress would have remedies not available to the Court. An example would be a statute requiring publication of an invention for citation of prior art by anyone interested, with Patent Office review before such patent could be enforced. Even such a statute preferably should not single out computer programs for this treatment, because if desirable at all it would be desirable in *any instance* in which the Patent Office regarded its facilities as unusually deficient.

II. THE COURT SHOULD NOT REVERSE THE CCPA ON MERE NICETIES OF CLAIM DRAFTING.

As to the Appellant's Argument I* this brief notes agreement with the general principle that a claim should not be allowed which covers *merely* a mental process. It is perhaps unimportant to the public interest whether the present claims are held to distinguish sufficiently from a *mere* mental process (as by reference to "registers") so long as the Court makes clear (if it finds the present language not acceptable) that *some* language more clearly requiring a process of operation of a computer machine must be accepted. Because there is doubt this court should even concern itself with the niceties of how well a claim distinguishes from a *mere* mental process, we urge affirmance of the decision of the CCPA.

---

* "I. The claimed process is unpatentable because it is no more than a set of mental steps for carrying out mathematical procedures."

The inclusion of Argument II in the Appellant's brief suggests that the Patent Office may in its Argument I have been trying a little too hard to find ways to refuse patents in this area.

CONCLUSION

The judgment of the Court of Customs and Patent Appeals should be affirmed.

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In the

Supreme Court of the United States

OCTOBER TERM 1971

No. 71-485

ROBERT GOTTSCHALK,
Acting Commissioner of Patents,
Petitioner,

—v.—

GARY R. BENSON and ARTHUR C. TABBOT,
Respondents.

ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS

BRIEF *AMICUS CURIAE* FOR WHITLOW COMPUTER SYSTEMS, INC.

Question Presented

Whether the operation of a digital computer under the control of a computer program is embraced within 35 U.S.C. 101 as a class of patentable subject matter.

Interest of *Amicus Curiae*

Whitlow Computer Systems, Inc. (hereafter Whitlow) has received consent from both parties to file this Brief as *Amicus Curiae*. The letters of consent have been filed with the Clerk of this Court.

Whitlow, a New Jersey corporation, is engaged exclusively in the development, production and sale of

computer programs used in the operation of general purpose digital computers. Whitlow also supplies various support services to computer users and the data processing industry in general.

Whitlow believes that it needs and is entitled to the full protection of the patent laws, as written, for its inventions and discoveries of new and imaginative ways in which a computer can be operated under the control of computer programs. It can be fairly asserted that the sale and use of computer programs has been effectively controlled by large computer manufacturers[1] and that these manufacturers will continue to dominate this field unless computer programs are protected by patents. It is obviously in the interest of all computer manufacturers that no restrictions be placed on the use of their equipment. But it is Whitlow's firm conviction that just as the computer manufacturers have access to the patent laws for protection of their computer equipment, so should Whitlow and others similarly situated have equal protection under the patent laws for inventions and discoveries in computer programs.

Whitlow, by applying for a patent on a computer program which took seven skilled technical personnel twelve man-years of work to develop and thereafter by concentrating virtually all its efforts on perfecting and marketing this computer program, has placed its faith in the patent system.[2]

Thus, Whitlow's interest is clear. If this Court affirms the decision below, it will ensure review of Whitlow's patent application by the Patent Office. Whitlow is con-

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[1] *See EDP Industry Report*, Vol. 6, No. 15, June 16, 1971.

[2] It has been Whitlow's experience that the financial community views investment in the software industry with justifiable apprehension because it is not certain whether computer programs will be accorded the benefit of the patent system. Whitlow believes that many potential investors refused to invest in Whitlow simply because it could give no assurance that its computer programs will be held to be patentable subject matter.

fident that its invention can be tested under and will satisfy all standards of patentability under 35 U.S.C. §§ 101-103 relating to novelty, utility and unobviousness. If this Court reverses the decision below, the unpatentability of Whitlow's computer program will *a fortiori* be finally decided, as may its continued ability to compete with computer manufacturers in the computer programming industry.

In support of an affirmative answer to the question presented, it is the objective of Amicus Whitlow to convince this Court: *first*, that as a practical matter, it is essential for continued and orderly growth of the computer programming industry as well as in the interest of our national economy that high technology in general and computer programs in particular always find a place in our patent system; *second*, that the operation of a computer under the control of a computer program, by definition, cannot be said to be a series of mental steps; *third*, Congress has already acted in 35 U.S.C. 100(b) to include this subject matter under the Patent Act wherein it has defined a patentable "process" *inter alia* as a "new use of a known . . . machine"; and *fourth*, that the Patent Office not only has the capability of examining inventions in computer programs but also has a statutory duty to do so.

Statement

1. Computer Programs

A computer program is a sequence of instructions for controlling the operation of a digital computer.[4] When a

[4] *American National Standard Vocabulary for Information Processing, Standard No. ANSI X3.12—1970* (Revision of USA Standard X3.12—1966), at 30, approved February 18, 1970 by the American National Standards Institute, Inc. The development of this Standard Vocabulary was sponsored by Amicus Business Equipment Manufacturers Association (BEMA). This Vocabulary was adopted by the U. S. Office of Management and Budget on October 16, 1970.

program is inserted into the computer, it interacts with components of the computer to form a sequence of electrical signals that cause various components of the computer to operate in a particular fashion. For example, certain instructions can be used to cause the computer to add or subtract signals representative of numbers; and, by performing repeated additions or subtractions, the computer can be made to multiply or divide.

If the computer could perform only these arithmetical operations under control of a computer program, it would be little more than an elaborate slide rule, adding machine or desk calculator. However, the computer is also able to perform logical operations such as comparing signals or testing for the presence or absence of specified conditions. These properties, and the computer's ability to store the results of its operations, enable the computer to perform intricate operations repeatedly, to improve its performance automatically, and to modify its sequence of operation so as to produce results that could not have been attained in any practical way by a group of human beings.[4]

Because the operations that a computer performs can be varied simply by modifying the program, computer-program-control of a digital computer makes the digital computer an extremely flexible instrument[5] that renders it susceptible to use in a wide variety of applications.[6] Im-

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[4] "[Computation by human means is] as a practical matter, impossible because of the enormous amount of calculations to be made and the vast amount of time that would be required with any method other than a computer." Brief for International Business Machines Corporation as Amicus Curiae (hereafter cited as the IBM Brief) at 12.

[5] IBM Brief at 12.

[6] A number of such uses are listed by Amicus Business Equipment Manufacturers Association. Brief for Business Equipment Manufacturers Association as Amicus Curiae (hereafter cited as the BEMA Brief) at 17-19.

portantly, the extensive storage capacity and flexibility of the computer permit the use of programming techniques that can operate the components of the computer in significantly different ways to achieve the same result; and programs which use the computer's resources creatively can achieve a given result using considerably less computing time or computer storage capacity.[3] Thus, there is considerable room for improvement in programming techniques over the state of the art.[4] Amicus Whitlow contends that the class of statutory subject matter under

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[3] This Court, by taking judicial notice of the computer's ability to operate in different ways and to improve its performance, must reject the absurd comparison of a computer to a player piano and the equally absurd comparison of a computer program to a player piano roll. BEMA Brief at 8, Petitioner's Brief at 26. The only meaningful similarity between the two is that a computer program, like a piano roll, must take some tangible form so that it can interact with the machine. In contrast to a piano roll, which is simply a substitute for a pianist who would strike the same keys in order to play the same musical composition, a computer program functions without human intervention to control the performance of operations in the computer which are beyond human control. Neither the player piano's mechanism nor the piano roll can change the piano's internal operation so as to produce the same output (i.e. the musical composition) more efficiently or in significantly different ways in any way comparable to a computer program changing the operation and efficiency of a computer.

[4] Present day programming techniques operate modern computers at an average efficiency of only 40% of their computing capacity. It has been estimated that "another 20%-30% increase [above the present 40% efficiency level] in utilization is possible through more efficient computer system utilization." Auerbach Info Inc., Philadelphia, Pa., *Computer Software*, EDP Series No. 7, at 22 (1971).

An example of the efficiencies that can be attained in operating a computer can be found in a patent application filed with the U. S. Patent Office by Amicus Whitlow on an improved method of sorting and ordering data. Other computer programs exist for this purpose. However, the technique claimed by Whitlow accomplishes the same result in approximately half the time required by other programs on the same computer.

35 U.S.C. 101 should embrace both the new applications to which the computer will be applied and the new techniques that a computer programmer devises for the efficient and expeditious operation of a digital computer.

2. The Question Presented

It is important at the very outset to clarify the question presented here on appeal. It is submitted that, taken collectively, the briefs supporting Petitioner tend to confuse and broaden the question presented because they ask that this Court analyze and understand the mathematics underlying conversion from binary coded decimal representations to binary representations and they imply that the decision below should be reversed if this Court finds that such a mathematical conversion is obvious in the mathematical arts. But the question of obviousness is not before this Court. Indeed the Court below went to considerable effort to emphasize that the issue was simply whether the operation of a computer programmed to receive information in binary coded decimal form and convert it into binary form is embraced within 35 U.S.C. 101. Judge Rich stated explicitly:

> "As to these claims, no prior art is cited and no question is raised as to utility, novelty or unobviousness. The asserted advantages and the explicit advantage resulting therefrom in the data-processing art have not been questioned.
>
> . . . .
>
> "... It is our opinion that up until the time of appeal to this court there was only one ground of rejection relied upon and that was noncompliance with section 101.
>
> . . . .
>
> "... We conclude, appellant's apprehension notwithstanding, that the examiner and the board relied

on only one ground, predicated on 35 U.S.C. § 101, that claims 8 and 13 are either directed to or at least embrace non-statutory subject matter. . . .

"We turn then to consideration of what the solicitor's brief admits is the 'principal rejection' predicated on section 101, which we find to be the only rejection.

. . . .

". . . We conclude that the Patent Office has put forth no sound reason why the claims in this case should be held to be non-statutory.'"[9]

Amicus submits, therefore, that the question of patentability based upon the statutory substantive issues of novelty, utility and non-obviousness can only be answered on a case-by-case basis once the question here presented is answered in the affirmative.[10]

Summary of Argument

Technology has historically been one of the principal assets of the economy of the United States. Despite early promises that the independent computer programming industry would grow rapidly in the 1960's and 1970's, it has become relatively stagnant. Very few computer programs developed by this industry have enjoyed wide-

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[9] *Application of Benson & Tabbot*, 441 F.2d 682, 684-688 (C.C.P.A. 1971), *cert. granted*, 405 U.S. 915 (1972).

[10] It should be noted that Respondents' patent application can be subjected to further proceedings in the Patent Office on these questions if remanded to the Patent Office for issuance following decision by this Court. "[I]f the examiner has specific knowledge of the existence of a particular reference which obviously meets the terms of any of the appealed claims as to which the examiner was reversed, he should submit the matter to the group director for authorization to reopen prosecution under rule 198 [Rules of Practice in Patent Cases, 37 C.F.R. 1.198] for the purpose of entering the new rejection." § 1214.04, Patent Office, U. S. Department of Commerce, *Manual of Patent Examining Procedure* (1961). It is possible, therefore, that the examiner will conclude that he must reopen prosecution in view of the references cited on the obviousness allegation by Amici supporting Petitioner.

spread commercial success and those programs that are developed are often held as trade secrets. Until it is guaranteed that the incentives provided by the patent laws apply to computer programs as a class of high technology, there will be continued reluctance to invest time and money in this technology. Absent patent protection, it can be expected that the currently favorable balance of trade in this technology will inevitably deteriorate as the accomplishments of other nations approach or surpass those of the United States.

It is unreasonable to conclude that the operation of a general purpose digital computer under the control of a computer program is a series of mental steps. A computer program is a series of instructions for operating, using, or controlling the machines called general purpose digital computers. Many of the tasks performed by these machines cannot be accomplished by humans and a computer program by definition is intended for use in a computer. Thus, computer technology, as it relates to both hardware and software,[11] is quite distinct from human mental activity.

In the Patent Act of 1952, Congress expressly included new uses of known machines within the definition of patentable processes, thereby codifying a long established rule that new uses of existing machines were a class of patentable subject matter. General purpose digital computers are machines designed and intended specifically for a great variety of uses (many of which are still unrecognized or undiscovered) in diverse areas of technology. Computer programs are the means for operating these machines to achieve these new uses.

Finally, there is no basis in law for this Court to exclude computer programs from a statutory class of patentable subject matter because of the administrative failings of the Patent Office.

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[11] "Hardware" designates the electronic and mechanical components of a computer and "software" refers generally to computer programs.

ARGUMENT

I. Practical Considerations Dictate That Patent Protection Is Needed For Orderly Growth In The Computer Programming Industry And Is Desirable To Maintain The Preeminent Position Of The United States In This Technology.

A. Continued Growth of the Computer Programming Industry Would Be Jeopardized by the Lack of Patent Protection for Its Products.

Commercial installations of stored-program computers egan about 1953.[11] In the 1950's, computer users either sed programs distributed free of charge by computer anufacturers or developed their own programs. Conderable cooperation prevailed at this time among comter users and manufacturers because of the lack of sential programs and the scarcity of skilled programers required to develop them.[12]

When the second generation of computers was developed the early 1960's, it became necessary to convert the comter programs developed for the earlier machines to proams that would operate on the newer machines. Many dependent software enterprises were formed to meet this ed. The same conversion process was required when a ird generation of computers became available in the mid-60's, and again this need was met by independent softare companies. During this period the United States overnment also required extensive programming services r defense and space applications. Much of this work

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[11] 6 *Encyclopedia Britannica* 245A (1972).

[12] For example, the SHARE Organization was formed in 1955 this purpose and it freely distributed to users of IBM equipt such valuable programs as UAFAP, which was developed at ted Aircraft Corp. By the late 1960's the contribution of comter programs to SHARE decreased sharply as more and more grams were regarded as valuable property and were retained as secrets. In 1970 the SHARE Organization was assimilated SHARE Inc., located at 25 Broadway, New York, N. Y.

was performed by the independent programming industry.[14] As a result of these pressures, the independent software industry expanded rapidly through most of the 1960's.[15]

By 1969 the conversion of computer software from second generation equipment to newer equipment was largely completed and there was little expectation that there would be much need for conversion in the future. At that time government requirements for computer programming markedly decreased and funds available for investment in the independent software industry were drastically reduced.[16] Consequently, independent software companies could no longer rely on many of the sources that previously had funded the development of computer programs. Rather, independent software companies now had to rely on other ways of commercially exploiting their programming expertise, chiefly by developing and selling proprietary computer programs to meet the specific needs of industry in general. However, successful commercial exploitation of such programs proved exceedingly difficult. Of approximately 600 programs that are presently being marketed by independent software companies, only eight have gained wide acceptance in the marketplace;[17] and of the independent software businesses that were operating in January 1970, it is likely that only half presently exist as independent entities.[18] Moreover, because of the uncertain state of patent protection for computer programming,

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[14] *Computer Software*, *supra* note 8, at 27-29 and 39-40.

[15] Thus, in 1966, there may have been some justification for Hon. D. F. Turner to observe that there was no need for patent protection to further development of computer programming. Letter from Hon. D. F. Turner, Assistant Attorney General, Antitrust Division, to Hon. E. J. Brenner, Commissioner of Patents, October 21, 1966, quoted in BEMA Brief at 11.

[16] *Computer Software*, *supra* note 8, at 39-40.

[17] Id. at 32.

[18] Id. at 31.

many of the best programs are being held as trade secrets."[19] Indeed, if the decision below is reversed, secrecy for *all* computer programs will be the rule rather than the exception.[20] Amicus Whitlow submits that the erection of secrecy barriers around computer programs would not be in the public interest since it would retard advancement in the programming technology by depriving others of existing knowledge and by necessitating duplication of effort to acquire such knowledge.[20a]

Patent protection has traditionally been an incentive for disclosure and a means for stimulating the investment of risk capital in new discoveries.[21] If patent protection continues to be available for computer software under the same standards that it is available for other inventions, such as those relating to computer hardware, full disclosure of programs would be possible. Admittedly, the right to use certain programs found to be novel, useful, and unobvious could be restricted. However, the right to restrict the use of computer programs is limited to commercial

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[19] Although the U. S. Copyright Office has been receiving registration forms on computer programs and will accept copies of computer programs deposited in compliance with the Copyright Act, there has been no judicial determination that copyright protection extends to computer programs. Assuming *arguendo* that copyright protection embraces computer programs, there is still intense debate over whether copyright protection extends to the operation of the computer in accordance with instructions set forth in a computer program. The prevalent view is to the contrary, namely that such protection extends only to the mere copying of the particular expression used by the programmer to define the operations of the computer. *See Baker* v. *Selden*, 101 U.S. 99, 103 (1880). In the face of this uncertainty, it would indeed be risky to deposit a copy of a computer program in the Copyright Office for all to see rather than to preserve it as a trade secret.

[20] An ABA committee has reached this conclusion: "Depending upon the outcome in [this appeal], it may be that trade secrets will become the standard operating procedure in the software area." Patent, Trademark and Copyright Section, American Bar Association, *Committee Reports*, at 253 (1972).

[20a] The undesirable effects of secrecy in the computer programming industry have been described by an Amicus in Support of Petitioner. See BEMA Brief at 12.

[21] *Graham* v. *John Deere Co.*, 383 U.S. 1, 9 (1966).

applications and does not cover experimental use."[11] Accordingly, further research and development will not be restricted by patenting and can only be aided by the disclosures made possible through patenting. Moreover, the right to obtain patent royalties on the commercial use of a patented computer program will provide incentive for investment in research and development in the programming field."[12]

B. The Economic Position of the United States in the World Economy Would Be Adversely Affected by the Absence of Patent Protection for Sophisticated Technology such as Computer Programs

The importance of sophisticated technology such as computer programming to the United States economy is borne out by the fact that the United States has consistently maintained a favorable balance of payments in such technology notwithstanding the present overall deficit in its

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[11] Experimental use of a patented invention is not infringement. *Chesterfield* v. *United States*, 159 F.Supp. 371 (Ct. Cl. 1958); *Dugan* v. *Lear Avia, Inc.*, 55 F.Supp. 223 (S.D.N.Y. 1944), aff'd 156 F.2d 29 (2d Cir. 1946).

[12] That our patent system has spurred invention and at the same time benefited the public as intended by the framers of the Constitution was aptly stated by the Seventh Circuit Court of Appeals.

> "Under its constitutional right to legislate for the promotion of the useful arts, Congress passed the patent statutes. The public policy thereby declared is this: Inventive minds may fail to produce many useful things that they would produce if stimulated by the promise of a substantial reward; what is produced is the property of the inventor; he and his heirs and assigns may hold it as a secret till the end of time; the public would be largely benefited by obtaining conveyances of these new properties; so the people through their representatives say to the inventor: Deed us your property, possession to be yielded at the end of 17 years, and in the meantime we will protect you absolutely in the right to exclude every one from making, using, or vending the thing patented, with your permission." *Rubber Tire Wheel Co.* v. *Milwaukee Rubber Works Co.*, 154 F. 358, 361 (7th Cir. 1907), citing *Bloomer* v. *McQuewan*, 55 U.S. 577, 586, 587, 14 How. 539, 548 (1852); *United States* v. *American Bell Telephone Co.*, 167 U.S. 224 (1897); and *Bement* v. *National Harrow Co.*, 186 U.S. 70 (1902).

balance of payments. An analysis of technological exchanges between the United States and foreign nations from 1956 to 1965 shows a surplus in favor of the United States rising from $311 million in 1956 to over $1 billion in 1965.[34] By 1969 the surplus of payments accounted for by high technology and its products reached $1.67 billion.[35] A large portion of the overall balance of trade is due to the export of data processing systems that contributed 47.5% of the 1969 surplus.[36]

However, the strong support high technology has given the United States trade position has recently shown signs of weakening. In 1970, for example, data processing equipment accounted for only 37% of the trade surplus.[37] In 1971 the trade surplus in high technology products decreased by $1.3 billion. It is no mere coincidence that in 1971 the United States suffered its first deficit in the overall balance of trade since 1893.[38]

An important reason for the weakening of the United States trade position with respect to foreign nations has

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[34] Organisation for Economic Cooperation and Development, *Reviews of National Science Policy—United States*, at 325-328, (1968).

[35] Staff Study, Office of International Investment, Bureau of International Commerce, U. S. Department of Commerce, "Policy Aspects of Foreign Investment by U. S. Multinational Corporations", at 30-40, in Bureau of International Commerce, U. S. Department of Commerce, *The Multinational Corporation*, 1 *Studies on U. S. Foreign Investment* (1972).

[36] BEMA, *Foreign Trade Issues Affecting the Data Processing Equipment Manufacturing Industry* (1972). *See* Hon. M. H. Stans, Secretary of Commerce, "On Science, Technology and the Economy," Statement before the Subcommittee on Science, Research and Development of the House Committee on Science and Astronautics, July 27, 1971.

[37] BEMA, *Foreign Trade Issues Affecting the Data Processing Equipment Manufacturing Industry*, *supra* note 26, at 2.

[38] Hon. P. G. Peterson, Secretary of Commerce, Statement before the Subcommittee on Science, Research and Development of the House Committee on Science and Astronautics, April 11, 1972.

been the increasing deficit in the trade of low technology products and raw materials while the surplus in trade of high technology products has stagnated.[29] In recent years the rate of technological development in the United States has lagged behind that of other countries which presently are rapidly acquiring and implementing knowledge and know-how originally developed in the United States.[30] As a result, with less expensive labor markets and government protected industries, foreign countries are supplanting United States industries involved in sophisticated technological products and processes such as the semiconductor technology.[31] Because of the continuous acquisition of United States technology by foreign countries, new areas of technology must be continuously and aggressively developed so that the United States world trade position is not adversely affected.

Because of the need to restore the United States economy to a favorable competitive position with respect to foreign industry, crucial incentives for making our industry more efficient should not at this time be selectively abrogated. In the fledgling independent software industry resides the potential to streamline and revitalize domestic industry. This potential can only be realized if adequate incentives are given to inventors, particularly individual inventors

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[29] Id. *See also* U. S. Department of Commerce, *Technological Innovation: Its Environment and Management* (1967); E. Denison, *The Sources of Economic Growth in the United States*, Committee for Economic Development (1962).

[30] Statement of Hon. P. G. Peterson, *supra* note 28.

For a discussion of how United States technology is acquired by other countries, see J. E. Tilton, *The International Diffusion of Technology: The Semiconductor Case* (1971).

[31] *The International Diffusion of Technology: The Semiconductor Case*, *supra* note 30.

and small organizations" who cannot and will not spend the time, effort and money necessary to achieve necessary technological breakthroughs without the assurance that patent protection can be obtained for their inventions. Accordingly, regardless of the position assumed by foreign countries concerning the patentability of computer programs, the United States should welcome all patent applications for computer programs and, after suitable review by the Patent Office, should protect novel, useful, and unobvious computer programs thus insuring the development of the domestic independent software industry."

"Notwithstanding the high concentration of researchers in corporate laboratories, more than half of the important twentieth century inventions investigated by Professor John Jewkes were found to have been produced by independent inventors. The subject matter of these inventions includes, *inter alia*, air conditioning, automatic transmissions, Cinerama, the cyclotron, electric precipitation, the helicopter, the jet engine, Kodachrome, magnetic recording, penicillin, Polaroid camera, power steering, radio, streptomycin, Xerography, catalytic cracking of petroleum, airplane, cotton picker, gas refrigerators, insulin. *See* Jewkes, Sawers & Stillerman, *The Sources of Invention*, at 82-85 (1958).

"Certain Amici point out that several foreign countries do not at present allow patents for computer programs. BEMA Brief at 26-29 and IBM Brief at 26-29. However, it should be noted that these decisions not to grant patents have generally been made by Patent Office tribunals and cannot be said to be settled. In fact, the Canadian Patent Office has recently reversed its position on the patentability of computer programs and now generally agrees with the United States Court of Customs and Patent Appeals. See *In Re Waldbaum*, (Canadian) Patent Office Record, Vol. 100, No. 3, January 18, 1972, at vii. Inasmuch as many foreign countries follow U. S. patent practice, it is likely that they may ultimately follow the decision of this Court with respect to the patentability of computer programs.

Even if patent protection were not available in a foreign country, it is unlikely that data would be exported to foreign countries for computer processing as certain Amici contend. *See* BEMA Brief at 27 and Burroughs Brief at 19. The possibility that the computer processing could be done by computers based in foreign countries where no patent protection is available would insure that any computer program patented in the U. S. would be available for license in the U. S. at a reasonable and competitive royalty.

II. The Operation Of A Digital Computer Under The Control Of A Computer Program Is Not A Series Of Mental Steps.

Article I, Section 8, Clause 8 of the Constitution of the United States provides:

> "[Congress shall have power] . . . To promote the Progress of Science and useful Arts, by securing for limited Times to . . . Inventors the exclusive Right to their . . . Discoveries;"

The constitutional standard was aptly explained in *Graham* v. *John Deere Co.*, *supra*, where this Court stated:

> "Innovation, advancement, and things which add to the sum of useful knowledge are inherent requisites in a patent system which by constitutional command must 'promote the Progress of . . . useful Arts.' This is the standard expressed in the Constitution and it may not be ignored." 383 U.S. 1, 6.

In discharging its responsibility as final interpreter of the Constitution, this Court has consistently been mindful of the constitutional standard and has repeatedly limited the grant of patent monopolies to discoveries which are consistent with this standard and the Acts of Congress. Thus, it has long excluded as unpatentable intangible knowledge such as scientific principles, methods of doing business, laws of nature, ideas and other abstractions. *Le Roy* v. *Tatham*, 55 U.S. 167, 14 How. 156 (1852); *O'Reilly* v. *Morse*, 56 U.S. 65, 15 How. 62 (1853); *Burr* v. *Duryee*, 68 U.S. (1 Wall.) 531 (1863); *Fuller* v. *Yentzer*, 94 U.S. 288 (1877); *Tilghman* v. *Proctor*, 102 U.S. 707 (1880); *DeForest Radio Co.* v. *General Electric Co.*, 283 U.S. 664 (1931); *Mackay Radio & Telegraph Co.* v. *Radio Corp. of America*, 306 U.S. 86 (1938).[*]

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[*] *See also Manhattan General Construction Co.* v. *Helios-Upton Co.*, 135 F. 785 (C.C.E.D. Pa. 1905); *Hotel Security Checking Co.* v. *Lorraine Co.*, 160 F. 467 (2d Cir. 1908).

The underlying rationale of these cases is that the utilization of such knowledge is essentially mental in character and that the patenting of such knowledge would result in the withdrawal of large segments of knowledge from public use and their subjection to intellectual monopolies in direct contravention of the constitutional purpose of promoting advances in the useful arts. As stated by Petitioner such intangibles are "the basic currency . . . of scientific development whose free exchange must not be hindered by the granting of monopolies."[15] With this, Amicus Whitlow is in full agreement.

For the very reason that such intangibles are the currency of scientific development, they are also in many cases the cornerstone of invention. This Court, by reviewing patents based upon the *application* of such intangibles for novelty, utility and obviousness, has necessarily concluded that such *applications* were patentable subject matter under the predecessor of 35 U.S.C. 101. *See The Telephone Cases*, 126 U.S. 1 (1888): *DeForest Radio Co.* v. *General Electric Co., supra; Mackay Radio & Telegraph Co.* v. *Radio Corp. of America, supra; Funk Brothers Seed Co.* v. *Kalo Inoculant Co.*, 333 U.S. 127 (1948).[16] See also *Dow Chemical Co.* v. *Halliburton Oil Well Cementing Co.*, 324 U.S. 320 (1945).

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[15] *See* Petitioner's Brief at 15.

[16] Some Amici, citing *Funk Bros.*, have argued that the Respondents' claimed invention is obvious over the mathematical relationship involved. Honeywell Brief at 13-17 and IBM Brief at 22-23. It should be recognized that in *Funk Bros.* this Court found that the invention constituted patentable subject matter as an application of a law of nature but deemed the invention to be unpatentable because it was obvious under the test set forth by this Court in *Cuno Engineering Corp.* v. *Automatic Devices Corp.*, 314 U.S. 84, 90 (1941): ". . . if an improvement is to obtain the privileged position of a patent more ingenuity must be involved than the work of a mechanic skilled in the art." As indicated at pages 6 and 7 above, the question of obviousness is not before this Court.

Thus the fact that it is a scientific principle or mathematical relationship[37] upon which a development is built does not, of itself, deprive that development of rising to the dignity of invention provided the requisite tests for patentability are satisfied.

In applying the constitutional standard to method claims, the Patent Office and lower courts, particularly the court below, have evolved a seemingly easy to apply test commonly known as the "mental steps" doctrine. Simply stated, under this doctrine a method is not patentable if its essential aspects reside in mental or intellectual activity. See *Halliburton Oil Well Cementing Co.* v. *Walker*, 146 F.2d 817 (9th Cir 1944); *Application of Heritage*, 150 F.2d 554 (C.C.P.A. 1945); *In re Abrams*, 188 F.2d 165 (C.C.P.A. 1951); *Application of Lundberg*, 197 F.2d 336 (C.C.P.A. 1952); *Application of Venner*, 262 F.2d 91 (C.C.P.A. 1958); *Application of Jones*, 373 F.2d 1007 (C.C.P.A. 1967); *Application of Prater*, 415 F.2d 1378 (C.C.P.A. 1968), *mod. on reh.* 415 F.2d 1393 (C.C.P.A. 1969).[38]

In determining whether the operation of a digital computer under computer program control constitutes a series of mental steps, it is crucial to distinguish between mental activity which is a human activity, and something which is an aid to mental activity but is not a mental activity. The computer can be used as an aid to mental activity,

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[37] Petitioner and Amici in support of Petitioner argue that Respondents' claimed invention is nothing more than a mathematical relationship. *See* Petitioner's Brief at 17-30, BEMA Brief at 24-26, Burroughs Brief at 13-22, Honeywell Brief at 7, and IBM Brief at 7-13. It is essential to recognize that the claimed invention is not merely a mathematical relationship but rather is a method for efficiently operating a digital computer to convert a binary coded decimal number to a binary number using mathematical relationships that exist among the digit positions of these numbers.

[38] An excellent review and history of the development of the mental steps doctrine appears in the Appendix to Appellants' Brief, *Application of Benson & Tabbot*, *supra* note 9.

but the operation of the computer, as specified by the program, is a mechanistic process. It is not a human activity and it is not a sequence of mental steps.

A computer program, as we have substantiated above, is simply a sequence of instructions for controlling the operation of a digital computer to achieve a given result. The tasks to which it is directed are typically incapable of solution by human beings. The computer program itself, because of its very nature and reason for existence, has no utility in an environment devoid of the general purpose digital computer. It is the sole instrumentality for imparting utility to a general purpose digital computer. Therefore, the sequence of instructions (the steps) in the program has no reference to mental activity; its only reference is to the operation of a machine. In short, a computer program by definition is not a sequence of mental steps, since it is operable only on a computer."

" The question whether Respondents' claims are drafted with apparatus limitations sufficient to restrict application to machine implementation and exclude mental implementation should not be confused with the question of what constitutes patentable subject matter. An inquiry into the language of the claims is properly directed only to the statutory requirement that the claims set forth distinctly and with particularity the subject matter which applicant regards as his invention. 35 U.S.C. 112.

In the instant case it would appear that Respondents' claims 8 and 13 are not objectionable under 35 U.S.C. 112 as encompassing mental activity because these claims must be interpreted by reference to the specification and the specification discloses only machines (digital computers) for implementing the steps of the claims. *United States* v. *Adams*, 383 U.S. 39, 49 (1966); *Reed* v. *Parrack*, 276 F.2d 784 (5th Cir. 1960); *Bergman* v. *Aluminum Lock Shingle Corp. of America*, 251 F.2d 801 (9th Cir. 1957). Furthermore, in their reply brief in the court below, Respondents expressly stated that they "have always and consistently held that the appealed claims do not read on 'mental steps'". Appellants' Reply Brief, at 3, *Application of Benson & Tabbot*, *supra* note 9. It is submitted that such statement would provide a clear basis for a legal estoppel to a later inconsistent assertion. *See Moon* v. *Cabot Shops, Inc.*, 270 F.2d 539 (9th Cir. 1959), *cert. denied*, 361 U.S. 965 (1960). Moreover, claim 8 sets forth specific apparatus (a reentrant shift register) for performing the method; and the Court below, after careful analysis, concluded that "[c]laim 8 . . . covers only a machine-implemented process and the apparatus for carrying it out has been disclosed." *Application of Benson & Tabbot*, *supra* note 9, at 687.

III. The Operation Of A Digital Computer Under The Control Of A Computer Program Is Encompassed By The Subject Matter Selected By Congress To Effectuate The Constitutional Purpose Because It Constitutes A New Use Of A Known Machine As Explicitly Defined In 35 U.S.C. 100(b).

It is neither appropriate nor necessary that this Court direct Congress to legislate a new form of protection for computer programs as has been suggested by Petitioner[40] and Amici[41] in support of Petitioner, because Congress has already acted with sufficient clarity.

35 U.S.C. 101, entitled "Inventions Patentable", provides:

> "Whoever invents or discovers any new and useful process, machines, manufacture, or composition of matter, or any new and useful improvement hereof may obtain a patent therefor, subject to the conditions and requirements of this title."

In enacting the Patent Act of 1952, Congress clarified the statutory definition of a "process" as used in 35 U.S.C. 101 by codifying in 35 U.S.C. 100(b) process definitions enunciated in adjudicated cases.

The meaning of the term "process" is explicitly delineated in Section 100 entitled "Definitions", which provides:

> "When used in this title, unless the context otherwise indicates . . .
>
> "(b) The term 'process' means process art or method and includes *a new use of a known* process, *machine*, manufacture, composition of matter or material." (Emphasis added.)

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[40] *See* Petitioner's Brief at 32.

[41] IBM Brief at 33; Burroughs Brief at 24; BEMA Brief at 29.

Although the words emphasized were added to the Patent Act of 1952, it was not intended to create a new class of statutory subject matter nor was it intended to make all new uses patentable. The intention was to make those new uses which meet the requisite standards of novelty, utility and unobviousness patentable."[42]

The issue before this Court is simply whether subjecting a computer to a new use by means of a computer program is a "process" within the meaning of Section 100(b).[43] To decide this question, this Court need only find two facts, both of which are undisputed here. *First, the computer is a machine that is designed specifically to be subjected to an infinite variety of new uses.* There is no meaningful dispute on this fact. One Amicus aptly calls the computer "an almost completely flexible tool";[44] another Amicus states that the computer is capable of use

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[42] *See Grinell Corp.* v. *Virginia Electric & Power Co.*, 401 F.2d 451 (4th Cir. 1968); *Armour Pharmaceutical Co.* v. *Richardson-Merrell, Inc.*, 264 F.Supp. 1013 (D. Del. 1967), *aff'd* 396 F.2d 70 (3d Cir. 1968); *Cresap* v. *Chemplast, Inc.*, 216 F.Supp. 870 (D.N.J. 1962), *aff'd* 316 F.2d 920 (3d Cir. 1963); *Sun Chemical Corp.* v. *Brenner*, 267 F.Supp. 617 (D.D.C. 1967). *See also* Federico, *Commentary on the Patent Act of 1952*, 35 U.S.C.A. 1, at 16.

[43] In response to the argument advanced by one Amicus that the mere function of a machine is not patentable (IBM Brief at 23), it is observed that this rule does not apply in the case of a process patent involving a new use of a known machine. *Elrick Rim Co.* v. *Reading Tire Machinery Co.*, 264 F.2d 481, 487 (9th Cir. 1959), *cert. denied*, 360 U.S. 920 (1959).

[44] "The computer is an incomparable tool of exploration. So many possibilities and combinations may be explored in such a short time that the truly creative person can exercise his mind more freely than ever before and the less gifted person can, by trial and error, be more innovative than ever before. It is an almost completely flexible tool. The solution to any problem that requires sifting and sorting of information or making of computations and calculations can be described in a computer program. Mathematical and scientific problems are particularly susceptible to solution by use of a computer directed by the necessary computer program." IBM Brief at 11, 12.

in broad spectrum of applications ranging from cancer research to relieving crowded court dockets."[42] And Petitioner observes that general purpose computers are used because they "can perform operations under many different programs."[43] *Second, the computer program is the means by which the computer is subjected to its new uses.* Again there is no meaningful dispute on this fact. Petitioner states that "[t]he programs are the variable operating factors which give the computer's hardware circuitry its general utility."[44] One Amicus supporting Petitioner accepts the *American National Standard Vocabulary* definition of a computer program as "a series of instructions or statements, in a form acceptable to a computer, prepared in order to achieve a certain result."[45] Another Amicus supporting Petitioner divides the class of computer programs into systems programs that are "an integral part of the computer system functioning in a housekeeping or control capacity" and applications programs that "in effect, make a general purpose computer system function as a special purpose system for a limited time and purpose."[46]

By finding these two simple facts, this Court must necessarily conclude that program-control of a computer is statutory subject matter as a process under 35 U.S.C. 100(b) and may be patented provided the Patent Office, after examination, finds it meets the statutory standards of novelty, utility and unobviousness.

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[42] BEMA Brief at 16-19.

[43] Petitioner's Brief at 7.

[44] Id.

[45] IBM Brief at 6.

[46] BEMA Brief at 6.

IV. The Statutory Criteria Promulgated By Congress Can Be Applied To Computer Programming Technology As Effectively As To Any Other New And Sophisticated Technology.

Petitioner argues that there is presently no adequate system of classification, searching technique or research files to enable the Patent Office to apply the statutory criteria to computer program applications.[44]

In fact, the Patent Office for a number of years has examined applications and issued patents relating to methods of operating digital computers.[45] There has been no problem examining these applications either from the standpoint of the availability of Examiners technically qualified to understand the software technology or from the standpoint of their ability to search and collect related prior art. There has not, however, been a unified effort to collate and classify prior art relating to computer software until recently. In expectation of an increase in the filing of patent applications relating to computer software due to the growing importance of this technology, the Patent Office initiated a pilot program in cooperation with the Bureau of Standards to collate and classify prior art. Approximately 00 subject matter areas were established and defined[46] for

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[44] *See* Petitioner's Brief at 30-32.

[45] Such patents, dating back to September 1956, are either classified in or cross-referenced in Class 444, Programmed Data Processors, Data Processing Methods and Procedures. In addition, numerous software patents may be found in other Classes. For example, Class 340, Subclass 155 includes patents relating to seismic apparatus combined with or including a programmed data processor.

[46] G. Knight, Jr., *Hierarchical Descriptor Classification System for Documents Related to Computer Software—With Scope Notes* (970). This document was specifically prepared for the Administrator, Office of Systems Search and Documentation, U.S. Patent Office.

classifying an estimated 20,000 prior art publications relating to software. A coordinate index search system was developed by which both patents and publications are indexed according to one or more appropriate descriptor codes. The system was designed so that eventually searches can be conducted by computer rather than by the conventional manual method thereby increasing the efficiency and possibly the thoroughness of the examination process.

Notwithstanding the existence of a classification system, the Patent Office apparently has not considered the classification program to be of very high priority and consequently only about 10% of the prior art documents have been classified. Moreover no effort has been made to collect all patents disclosing or claiming data processing methods. Nevertheless, various Examiners have gathered together approximately 100 patents which have now been either directly classified or cross-referenced in the newly established software class. Thus, with minimal effort by the Patent Office, approximately 2,500 prior art documents have been classified and can now be searched as quickly and as easily as other areas of complex technology such as computer hardware."

Clearly then, the Patent Office appears to have the ability to examine patent applications in computer programming; and if there are any administrative difficulties as alleged, they must be solved by administrative means. The Patent Office has a statutory obligation to make the patent system function as intended by Congress and the

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"Computer software is generally acknowledged to have an equivalent form in computer hardware. In order to circumvent the Patent Office's objections to patenting computer software, software has been disclosed in its hardware equivalent form with the result that both apparatus and method, i.e., software, claims have been obtained. An example is Ferguson, U. S. Patent 3,422,404, *Apparatus and Method for Decoding Operation Codes in Digital Computers*, which discloses computer hardware. However, the inventor stated "It is a software patent." *Computerworld*, February 19, 1969

Constitution and this requires that it be administratively capable of examining patent applications relating to the frontiers of scientific achievement and facilitating disclosure of these new achievements to the public. Such functions are the very work product of the Patent Office.

This Court only six years ago admonished the Patent Office for using its administrative difficulties as an excuse for failing to adhere strictly to the statutory scheme of Congress.[44] In that case, the problem was the failure to examine applications for unobviousness under the requirements of 35 U.S.C. 103. Now the Patent Office, again because of alleged administrative difficulty, asks this Court to eliminate an entire technology from the classes of statutory subject matter. Amicus Whitlow believes that such action would deprive it and others similarly situated of equal protection under the patent laws on the shallowest of reason. Furthermore, if the Petitioner's rationale is followed, precedent will be set for excluding every new technology from the patent laws on a determination by the Patent Office that the technology is administratively too difficult to examine.[45] Clearly, this is in direct contravention of the constitutional intent as

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[44] ". . . We have observed a notorious difference between the standards applied by the Patent Office and by the courts. While many reasons can be adduced to explain the discrepancy, one may well be the free rein often exercised by Examiners in their use of the concept of 'invention.' In this connection we note that the Patent Office is confronted with a most difficult task. Almost 100,000 applications for patents are filed each year. Of these, about 50,000 are granted and the backlog now runs well over 200,000. This is itself a compelling reason for the Commissioner to strictly adhere to the 1952 Act as interpreted here. This would, we believe, not only expedite disposition but bring about a closer concurrence between administrative and judicial precedent." *Graham* v. *John Deere Co.*, *supra* note 21, at 18, 19 (footnote omitted).

[45] For other arguments against the Patent Office's reluctance to classify and search computer programs on grounds of administrative difficulty, see Bender, *Computer Programs: Should They Be Patentable?*, Colum. L.Rev. 241, 250-252 (1968).

implemented by Congress for advancing science in the United States by providing the incentive of eventual reward for venturing into relatively risky technological areas."

CONCLUSION

For the above reasons, Amicus urges this Court to find that the operation of a digital computer under program control is patentable subject matter under 35 U.S.C. 101 and to affirm the decision of the court below.

Respectfully submitted,

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August 1972

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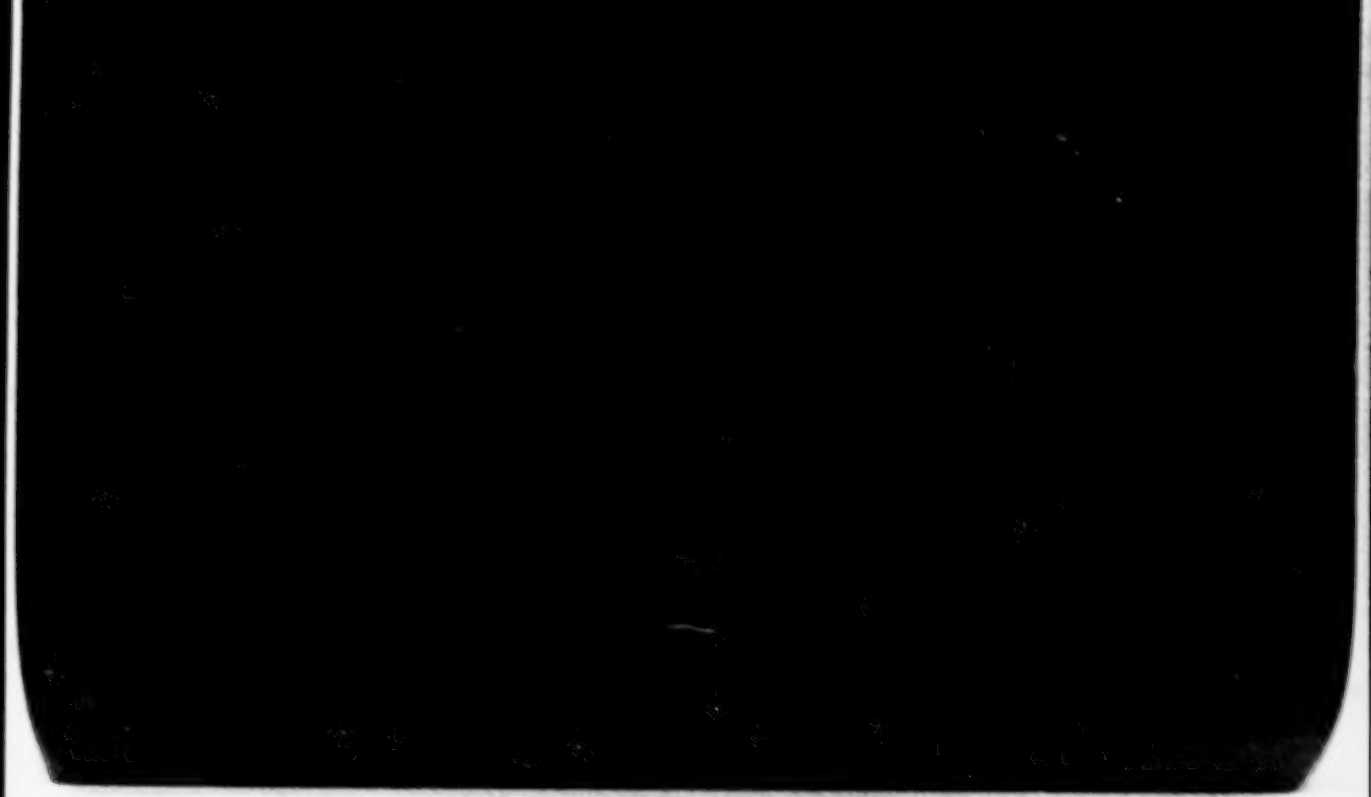
[16] In a well-known letter to Oliver Evans, Thomas Jefferson wrote "Certainly an inventor ought to be allowed a right to the benefit of his invention for some certain time. . . . Nobody wishes more than I do that ingenuity should receive a liberal encouragement." Letter from Thomas Jefferson to Oliver Evans (1807), V *Writings of Thomas Jefferson*, at 75-76 (Washington ed.) quoted in *Graham* v. *John Deere Co., supra* note 21, at 8. *See also Grant* v. *Raymond*, 31 U.S. 141, 156 (1832). Chester Carlson, the inventor of Xerography, stated "It takes patience to stay with an idea through . . . a long period. In my case I am sure I would not have done so if it were not for the hope for eventual reward through the incentives offered by the patent system." U. S. Department of Commerce, *Patents: Spur to American Progress*, at 7 (1965).



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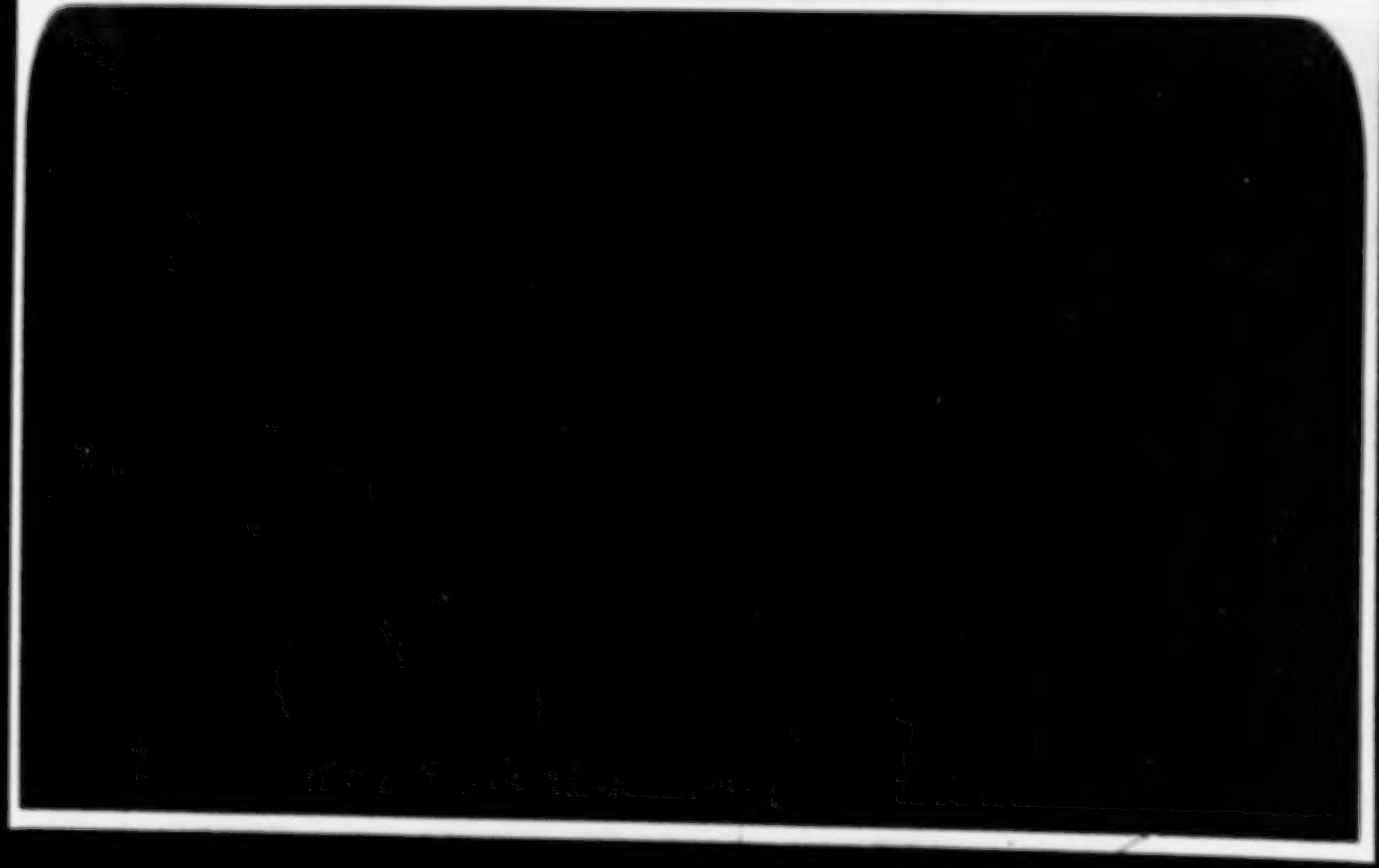

IN THE

Supreme Court of the United States

October Term 1971

No. 71-485

ROBERT GOTTSCHALK, COMMISSIONER OF PATENTS,
Petitioner

v.

GARY R. BENSON and ARTHUR C. TABBOT,
Respondents

ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS

BRIEF AMICUS CURIAE FOR THE ASSOCIATION OF DATA PROCESSING SERVICE ORGANIZATIONS, SOFTWARE PRODUCTS AND SERVICE SECTION (ADAPSO/AISC)

The Association of Data Processing Service Organizations, Software Products and Services Section (hereinafter ADAPSO/AISC) files this brief amicus curiae in opposition to Petitioner, and also files letters of consent of the parties in accordance with the Rules of the Court.

QUESTION PRESENTED

Whether
an automatic data processing machine or method
implemented by software[1] programming
is patentable equally with
the same machine or method
implemented by hardware[2] programming.[3]

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1. "software, the totality of programs and routines used to extend the capabilities of computers, such as compilers, assemblers, narrators, routines and subroutines" (Automatic Data Processing Glossary, Executive Office of the President, Bureau of the Budget, . . . "for use as an authoritative reference by all officials and employees of the executive branch of the Government," Dec. 1962, p. 50).

2. "hardware, the physical equipment or devices forming a computer and peripheral equipment" (Ibid. p. 25).

For a discussion of relationships of the technologies of hardware and software as they bear on legal issues before the Court, see Jacobs, *Computer Technology (Hardware and Software): Some Legal Implications for Antitrust, Copyrights and Patents*, Rutgers Journal of Computers and Law, Vol. 1970, No. 8, at p. 50.

3. Programming built into hardware; see "Hardware Design Reflecting Software Requirements," by Prof. Saul Rosen, 33 Proc. of the Fall Joint Computer Conference, Dec. 1968, Pt. II, pp. 1443, 1444.

INTEREST OF AMICUS CURIAE

ADAPSO/AISC is a trade association[4] of companies in the software sub-industry of the computer industry. Its members are variously engaged in the marketing of software products and software services to computer users and to hardware manufacturers.

ADAPSO/AISC presents its views to the Court because a distorted description of the software technology and the software sub-industry has been set forth by Petitioner's Brief and the supporting briefs of the hardware manufacturers and their association, BEMA. Moreover, with total lack of candor, the hardware manufacturers have failed to advise the Court that they have often obtained U.S. patents for hardware-implemented

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4. ADAPSO/AISC was formed by merger in June 1972 of the Software Products and Service Section of ADAPSO and the Association of Independent Software Companies (AISC), the latter comprising 8 companies and the former 25 companies. In a recent poll of the members, taken in connection with the filing of this brief amicus curiae (75% responding), more than 60% were classified as small business, and 80% had annual sales under $10 million, 20% have applied for a software patent, 15% have such a patent, 60% expect to apply for such a patent within the next five years, 35% would be adversely influenced by a lack of patent protection in making a decision on whether to invest in research and development in software technology. Members of ADAPSO/AISC are:

American Information Development, Applied Data Research, Atlantic Software, Inc., Bank Computer Network Corp., Boole & Babbage, Inc., Capex Corporation, CBM, Inc., Cincom Systems, Computer Business Management, Computer Corp. of America, Computer Information Management, Computer Systems & Education, Computer Wares, Inc., Computation Planning Co., Comress, Datamann, Inc., Data Usage Corp., Dynamic Data Services, Inc., Equimatics, Inc./United Systems Intl., Independence Computing & Software Corp., Informatics Tisco, Inc., Information Management Associates, Insurance Systems of America, International Computer Programs, National CSS, Inc., Network Data Processing Corp., Pansophic Systems, Inc., Planning Research Corp., Pryor Computer Software, Systonetics, Inc., System Development Corp., Western Operations, Inc.

code converters involving mathematical procedures of the same kind as those at issue in this case. Two representative examples of such hardware code-converter patents[5] recently issued to IBM and Honeywell (copies attached in the Appendix herein) demonstrate that every one of the arguments put forward by Petitioner's and the supporting hardware manufacturers' briefs against the patentability of the Benson and Tabbot code converter (which arguments ADAPSO/AISC refutes) apply in the same way to patent claims in these IBM and Honeywell hardware patents.[6]

BEMA's Brief (p. 7, f.n. 9) recognizes that its arguments endanger the validity of hardware patents such as the attached ones of IBM and Honeywell, and tries to suggest that distinctions may exist. However, it is quite clear that the hardware manufacturers are prepared to sacrifice their hardware patents if necessary to prevent potential competitors from obtaining software patents.

A patent for a software code converter is not the issue before the Court, except nominally. Such code converters are more typical of hardware patents (witness the attached patents of IBM and Honeywell). A patent for Benson and Tabbot's invention is of negligible importance; it is hardly representative of the grand sweep of the software technology.

The attack of the hardware manufacturers deals with far more momentous matters. They attack hope of innovation and competition in standarized software products so sorely needed by computer users; they attack the very existence of an independent software subindustry within the computer industry; they attack the hope that the computer will help the nation solve some of the awesome problems that it faces.

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5. IBM Patent U.S. 3,624,637; Honeywell Patent U.S. 3,505,675.

6. Such code converters are typically implemented by hardware. ADAPSO/AISC members would not view such a code converter as representative of their software products.

In order to describe the business stakes involved in this matter, for both the hardware and software companies, as well as the broader interests of the nation, ADAPSO/AISC presents the following outline of the software sub-industry and its relation to the larger computer industry.

NATURE OF THE SOFTWARE SUB-INDUSTRY

Some of the ADAPSO/AISC members market software in competition with hardware manufacturers such as IBM and Honeywell. At least they attempt to do so in a unique business situation which makes it extraordinarily difficult for the software companies to compete with IBM and the other hardware manufacturers.

It is attractive to small business to try to enter and innovate in the software industry because software technology is of such a special character. That is, it is relatively easy and inexpensive to reproduce in the form of a deck of punch cards or a tape recording. Software (what is commonly called a computer program) takes the physical form of a recording of complex combinations of electrical signals whose effect is to structure[7] general-purpose hardware into a unique special-purpose computer. Computer programs can also be built in a hardware form[8] (e.g. a read-only memory), in which case a complete set of electronic switches is replaced each time a program is changed. With the software form, the switches remain in the general-purpose hardware and they are configured by the software signals.

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7. Ivan Flores, "Computer Software," Science and Technology, May 1969, pp. 16, 17.

8. See IBM's memoranda describing IBM marketing strategy "for putting programming into hardware features (read-only storage) and repricing the present hardware and new programming features," Applied Data Research v. IBM, Civ. No. 158 (D. Minn., filed March 1969) (hereinafter ADR), settled out of court, Affidavit of Martin Goetz in Support of ADR's Motion for Injunction, at p. 22, ¶40.

On the other hand, this ease of reproduction of software has enabled the hardware manufacturers to develop monopoly positions with respect to the software that they market for their own hardware by giving the software away "free"—they actually include the price of their software in the hardware price[9] (an unlawful tie-in practice known in the industry as "bundling"). Monopoly results because "no customer is likely to pay [a software company] for his product if he can get it free from IBM."[10] Under the circumstances, IBM has found that it can make greater software profits by putting the price of the software in the hardware price and saying that the software is "free," "in addition to the obvious marketing advantages of the package."[11] To justify the almost total foreclosure of competition achieved by bundling, IBM has had to devise a false factual picture of the software, calling it a "mental process," which view is contradicted by the line of C.C.P.A. decisions[12] that have found software to be a machine device.

A small software company which is interested in developing a software product and in marketing it is confronted by two major problems of competition. First, the software company must set a price for its product to survive, but this is often difficult, if not impossible, because it may have to compete with the "free" software of

9. Hearing on Automatic Data Processing Before Brooks Subcommittee of the Committee on Government Operations, H. R., 92nd Congress, May 20, 1971, Testimony of D.A. Ink, Office of Management and Budget, pp. 25, 32.

10. Finding of court in Programmatics, Inc. v. IBM, Civ. No. 159 (D. Minn., filed 1969) (hereinafter PI) settled out of court, Transcript of Proceedings on Motion for Preliminary Injunction, at p. 873.

11. IBM Memorandum to A. K. Watson in ADR, *supra* note 8, at p. 23, ¶43.

12. *In re Prater*, 415 F.2d 1393 (1969); *In re Bernhart*, 417 F.2d 1395 (1969); *In re Mahony*, 421 F.2d 742 (1970); *In re Musgrave*, 431 F.2d 882 (1970); *In re Foster*, 438 F.2d 1011 (1971); *In re Benson*, 441 F.2d 682 (1971); *In re Waldbaum*, 173 USPQ 430 (1972).

IBM. Second, if the software product is sufficiently good to be successful, the small company then faces the devastating prospect that, in the absence of patent protection for its product, IBM and the other hardware manufacturers will be able to copy the technological concepts of the priced software and put out their own version, again "free." Thus the very features of software that attract small business to innovate also generally deter software companies from quixotically engaging in competition against "free" software in the absence of patent protection.[13]

For these reasons, the computer industry is twice dominated by IBM. First, IBM has had for years about 75% of the "main frame"[14] business, more than ten times that of its nearest competitor, Honeywell.[15] The remainder of that business is shared by such giant corporations as Sperry Rand, Burroughs, Control Data, National Cash Register; companies such as General Electric and RCA were unable to compete with IBM and were forced to retire from the business.[16]

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13. See SOFTWARE, a corporate planning report, International Data Corp., Feb. 28, 1972, at p. C-6.

One instance of a software product marketed in competition with a "free" IBM product was the basis of the PI case, supra note 10. (Transcript 775-77). PI offered a sorting product at a price in competition with a "free" IBM sorting product which had never faced any previous competition for the years it was on the market. The price was justified on an advertised claim that PI's sorting product would operate twice as fast and thereby cut IBM's rental charges in half for a major computer task. IBM then marketed a different sorting product, also "free" and operating twice as fast as the previous one, and PI's marketing effort was effectively crippled.

14. "main frame" is the processor or heart of general-purpose hardware that software structures into a special-purpose computer.

15. See Report, Brooks Subcommittee on H. R. 4845, Aug. 17, 1965, 89th Congress, 1st Session, House Report No. 802, "Domination of ADP Industry by IBM," at p. 11; ADR, supra note 8, Goetz Affidavit at p. 11, ¶26, 27; Letter of Richard Sprague to Judge Philip Neville re IBM Discovery in the antitrust suits of U.S. v. IBM and Control Data v. IBM published in Datamation, July 1972, p. 134.

16. See Sprague letter, *supra* note 15, at pp. 134, 135.

The second industry domination by IBM is in software. IBM continues to "bundle" its new system software, as well as all of its older software; that is, IBM saturates the market of users of IBM hardware with all that software as though "free" and forecloses it to competition. In addition, since 1970, IBM has "unbundled" certain of its new software, which it designates as "program products," and which amounts to a trifle of its total software line. Honeywell and Burroughs are completely bundled; other hardware manufacturers also bundle their systems software, and some separately price other parts of their software.[17] IBM's line of "free" software is many times greater than that of any of the other hardware manufacturers.

Thus, IBM's share of the software product market, primarily in the form of the "free" type, is much greater than its share of the "main frame" market. Its share is also affected by the "free" marketing practice which is so effective in foreclosing competition, and by its flexibility in setting prices for those of its products that are priced. IBM's share of that portion of the software market to which it supplies software products is undoubtedly greater than 90%.[18]

The state of affairs of a totally dominated computer industry is aptly summarized in a recent editorial in a computer trade journal[19] entitled "Should One Corporation Have Control Over an Instrument That Will Transform Global Civilization?" (copy attached in the Appendix, p. A-13)

IBM's dominance of the computer industry, and particularly of standardized software products having wide application, has produced the present condition of "poor quality software,"[20] the prime "crucial computer prob-

17. See SOFTWARE, *supra* note 13, at p. A-7.
18. See ADR, *supra* note 8, Goetz Affidavit at pp. 11-13.
19. COMPUTER DECISIONS, March 1972, p. 48.
20. Statement of Dr. Ruth M. Davis before the Government Activities Subcommittee, House Committee on Government Operations, May 16, 1972, at p. 12.

lem" confronting the nation today. As the Director of the Center for Computer Services and Technology of the National Bureau of Standards recently testified before Congress on the "seriousness of the problems besetting both the consumers of computer products and services and the suppliers of these products and services":[21]

> The *crippling problems* are lining up in the software rather than in the hardware field. In particular, they fall under what we call the application-independent problem category. . . . These are the software problems which are common to many applications. (*Emphasis added*)

Small technological companies and independent inventors have been responsible for much of the innovation of this age.[22] A special characteristic of the software technology is that computer scientists working as a small group have been found to be optimally effective in developing new complex software systems.[23] There are approximately 1100 companies, mostly "young and struggling" who "surely possess excellent technical innovative capabilities" and "the principal technical capability . . . to work . . . on our critical computer problems."[24] Because of other special characteristics

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21. Ibid. at pp. 11 and 12.

22. "Studies of the sources of invention and innovation have shown that independent inventors and small technologically based companies are responsible for a remarkably high percentage of the important inventions and innovation of this century." National Bureau of Standards Experimental Technology Incentives Program, Preliminary Program Description, Fiscal Year 1973 Budget Submission, at p. 9.

23. ". . . all the best programs there are today have been produced by small groups of very able people who were left to get on with it for a year or so in peace. Every man understood everything in the program. A group might grow to a dozen before it lost its coherence. Some big groups have written some very bad programs . . . It seems to be impossible for a very large group to work really efficiently." Lord Bowden, *The Language of Computers*, 58 American Scientist 43, 50, Jan.-Feb. 1970.

24. Davis, *supra* note 20, at p. 15.

of the technology, it offers continuing opportunities for small innovative companies to enter the industry.[24a] Without appropriate incentives and opportunities for such small software companies to compete, this "young and struggling industry"[25] will not grow but will stagnate as a dominated industry. "Imaginative use of computers may well hold the key to necessary improved productivity in our domestic economy,"[25a] and new software concepts can meet this challenge.

Another feature of the software technology of considerable significance to the possibility of small software companies competing with IBM,[26] though the giant hardware manufacturers cannot, is that it enables the building of special-purpose computers (of an endless variety and of great complexity) without requiring a different wiring configuration for each such computer. In place of the "hard wire" of special-purpose hardware, the software uses the "soft-wire"[27] of recorded electrical signals which have the physical effect when placed in the general-purpose computer of setting thousands (or even millions) of electronic switches in unique combinations. Each unique combination of set switches restructures[28] the general-purpose computer to a special-purpose computer. The general-purpose computer can be restructured by software as often and in as many ways

24a. Testimony of M. Jacobs in Hearings on S. 597 Copyright Bill, Before the Subcommittee on Patents, Trademarks and Copyrights of the Senate Committee on the Judiciary, 90th Congress, 1st Session, Pt. 3, at pp. 765-67, 772, 774 (1967).

25. Statement of Dr. Lawrence M. Kushner, Acting Director, National Bureau of Standards, before the Government Activities Subcommittee House Committee on Government Operations, May 16, 1972, at p. 4.

25a. Davis, *supra* note 20, at p. 15.

26. Testimony of M. Jacobs, *supra* note 24a.

27. The term "soft-wire" is used by engineers in the industry to indicate that the recorded signal combinations of software achieve the same effects as actual "hard-wire," but the advantages of modification and replacement without rewiring are also achieved.

28. Flores, *supra* note 7.

as desired, and in an instant, without the slightest change in its hard-wire constructions.

The general-purpose hardware is useless without software, and the special-purpose computers structured by the software is the reason that we have computers and a computer industry.[29] This technological feature of being able to build a new computer system whenever it is wanted without rewiring it is the principal reason for the success of the general-purpose computer and its widespread use; 1000 special-purpose computers can be attained with a single hardware configuration and 1000 software programs.

Small software companies have successfully competed with IBM in past years on the development of standardized software packages,[30] and they can do so in the future if they have appropriate incentives and an open and competitive industry in which to work. The hardware manufacturers are granted patents for their developments built with hardware programming. The counterpart implementations of similar developments by software programming are likewise deserving of patent protection, and such protection is needed to encourage private capital investment in innovative software by small business. The judicial recognition that software is a machine device also will assist in enforcement of the antitrust laws and outstanding injunctions against tie-ins to open the industry to competition.

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29. "All of the features that have been designed into digital computers may be considered to be, at least to some extent, reflections of software needs." Rosen, *supra* note 3, at p. 1443.

30. See SOFTWARE, *supra* note 17, at pp. A-5, 7 and C-2 to 6.

SUMMARY OF ARGUMENT

The C.C.P.A. decision herein and its prior decisions of the past four years have found as a fact that software, by the nature of the computer technology, is a part of a machine, albeit, as is true of other modern technologies, we cannot visually see its restructuring of the hardware. Since software programming is the engineering equivalent of hardware programming, computer developments in principle and often in practice can be implemented in either machine form, software or hardware. Just as patent protection has been granted to the hardware manufacturers for BCD-to-binary converters and other code converters, and for other programming devices implemented in hardware, so should such protection be granted to software inventors for their programming devices implemented in software.

Machines and their devices and parts have been patentable subject matter from the time of the first patent statutes. Patentability of the software type of machine requires no new principles of law.

The U.S. Patent Office has recognized the need for common search and classification facilities for both forms of technology, and has provided adequate facilities for both.

The only legal protection available for the innovative contributions in software technology is via the patent system. Copyrights and registration proposals would not provide the needed incentive for invention.

The antitrust law implication of the C.C.P.A. finding of fact that software is a machine device is that the bundling of "free" software with hardware by IBM and the other hardware manufacturers is an illegal tie-in in violation of Section 3 of the Clayton Act and Section Act and Section 1 of the Sherman Act.[21] The hardware manufacturers seek to deny the illegal tie-in of one machine device with another, and thus to justify these viola-

tions of the antitrust laws by arguments that the machine device of software is a "mental process" suitable for "free" pricing. These arguments collaterally attack the C.C.P.A. finding of fact that software is a machine device, and fly in the face of the totally machine nature of the computer industry whose very name, "automatic data processing," belies the assertions about "mental processes." Similar false justification is used to explain the Government's failure to enforce the antitrust laws against the tie-ins by hardware manufacturers and the failure to enforce outstanding tie-in injunctions against IBM.

ARGUMENT

I. Software as a machine device is patentable equally with hardware.

The import of Petitioner's position is that general-purpose hardware is a machine, but programmed hardware merely involves the addition of something that Petitioner and the supporting hardware manufacturers call a "mental process" (or a sequence of "instructions" as though it were an instruction manual, or something even more vague and indefinable called "know-how"[32]). In fact, software is actually a form of machine device which structures the general-purpose hardware.

The software form of computer programs is that which is more generally identified as a "program," while the hardware form of computer sequencing is equally a program though less usually so identified since it is in the form of electrical circuits. For example, a recent technical paper[33] by the Director of the Computing Center of Purdue University points out that "much of the sequencing that is done by hardware is the same kind of thing that is done in [software] programming." The paper uses "the term *hardware programming* to indicate programming built into hardware, either through a microprogramming system or by other hardware sequencing methods" (emphasis ours). It uses another term, "extended machine," to characterize the "combined hardware and software system" that is produced when a general-purpose computer is operated under the control of a software program.

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32. While the hardware manufacturers may not have deprecated software by equating it with mere "know-how" suitable for a give-away, the Government has; see Antitrust Division's Complaint in U.S. v. IBM, Civ. No. 69-200 (S.D.N.Y. filed Jan. 1969, in D. Minn. for discovery).

33. Rosen, *supra* note 3.

This paper[34] and others confirm the well established technological ". . . principle of the equivalence of programming and hardware. This principle begins to invade our consciousness when we recognize that a program for a general-purpose machine turns it into a special-purpose machine."[35]

Thus, the addition of a software program to control a general-purpose computer (thereby creating the "extended machine") is just as much a machine addition to the general-purpose computer as is the additional hardware programming that may be used to enlarge or enhance the character of an existing hardware computer. In both cases, the addition of programming results in a machine system which is different from the machine without the additional programming.

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34. Ibid. at p. 1443:

"Perhaps the most important part of the job of computer system design is to determine which functions are best handled by hardware, and which should be provided by software. All of the traditional engineering considerations come into play here. One must consider the added cost of additional hardware measured against possible gains in operating efficiency. One must consider the availability of manpower with the appropriate skills for design and for implementation. One must also consider intangible factors such as the inherent advantages of simplicity and the hidden costs of complexity.

"From the point of view of the computer user it makes no difference which features are incorporated into the hardware and which are programmed in software.

"It is the combined hardware-software system, the 'extended machine' that the user must rely on to provide the power and flexibility and convenience that have been promised with each new generation of computing equipment."

35. Continuing the quotation: "The principle becomes more tangible when we compare in detail the logical design of that special-purpose machine with the flow chart of that program, albeit the descriptive language of the logical design is somewhat different from the command language of the program." Final Report No. AD 59 URI, at p. 4, from Univ. of Penna. Moore School of Elec. Eng. by Prof. Saul Gorn, to U.S. Army Signal Research & Development Lab.

The C.C.P.A. found this fact as follows:

> . . . a general purpose computer may be regarded as but a storeroom of parts and/or electrical components. But once a program has been introduced, the general-purpose digital computer becomes a special-purpose digital computer (i.e., a specific electrical circuit . . .)[36]

and again, as follows:

> [W]e say that if a machine is programmed in a certain new and unobvious way, it is physically different from the machine without that program; its memory elements are differently arranged. The fact that these physical changes are invisible to the eye should not tempt us to conclude that the machine has not been changed.[37]

The hardware manufacturers have been obtaining patents for their hardware-implemented investions which were held to be patentable subject matter by the Patent Office Board of Appeals.[38] Moreover, the Patent Office has granted patent coverage to the machine process of hardware-embodied inventions on the theory that the software embodiment is the equivalent of the hardware and the inventor is entitled to protect both forms given his hardware embodiment.[39] The illustrative IBM and Honeywell patents (in the Appendix) both of which have machine and method claims to code converters, are illustrative of this general practice in the Patent Office.

There is no reason why software technology should not be entitled to the same patent treatment as hardware

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36. *In re Prater*, *supra* note 12.
37. *In re Bernhart*, *supra* note 12.
38. *Ex parte King and Barton*, 1964, 146 USPQ 590. This holding was reached though the Examiner took note of the engineering equivalence of hardware implemented inventions and those implemented by software and general-purpose hardware.
39. *Ex parte Lewin*, 1966, 154 USPQ 487.

programming, they are both machine devices, and that is the substance of the C.C.P.A. decision in this case. Disparate patent treatment of equivalent engineering forms of technology would be a violation of due process.[40] But, it has been achieved for many years by IBM and other hardware manufacturers through their strategy of "free" software and their deprecation, from vaunted positions of technical proficiency, of a technology that has been described by a computer pioneer as "one of the most remarkable of all the intellectual achievements of mankind."[41]

II. The patent office search and classification facilities meet the same standards of adequacy for software as those for the equivalent hardware.

No objections have been raised by Petitioner or the hardware manufacturers to the adequacy of the search facilities for hardware-implemented inventions. The hardware manufacturers know that much of the innovation in hardware was and still is first achieved in software. When a particular innovation was fully and widely accepted, the manufacturers would find it warranted to invest in the mass-production tooling required for hardware and would replace the software with hardware to obtain the advantages of that technological approach.[42]

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40. The only justification for this difference in treatment was a false and fearsome forecast from the hardware manufacturers that the Patent Office would be deluged with software patent applications if the floodgates were opened. Commissioner Brenner, *"The Future of Computer Programs in the United States Patent Office,"* Law of Software, 1968, pp. B-1, 12. Needless to say, the flood has not materialized in the years since the first C.C.P.A. decision of *Prater* finding software patentable as a machine and machine process.

41. *Bowden, supra* note 23, at p. 46.

42. One danger for hardware manufacturers in software patents is that they may lose full control of development of the hard-

Thus, the hardware manufacturers know, just as does the Patent Office, that the software prior art is as essential as the hardware prior art to adequate examination of the novelty of a hardware-implemented invention. Similarly, both are needed for examination of an equivalent software-implemented invention.

The comments on this point of the Report of the President's Commission on Patents, it is believed,[43] are based on inadequate information supplied to the Commission on the engineering equivalence of hardware and software and the need for corresponding search files and classification facilities for both software and hardware forms of computer inventions.

The issued patents of IBM and Burroughs attached to the Appendix herein demonstrate that adequate search and classification facilities exist in the Patent Office for BCD-to-binary converters and other code converters.

III. Copyrights and legislation for other forms of legal protection of proprietary rights are not effective to protect the machine devices of software.

1. **Other Legislation.** Attempts by IBM and other hardware manufacturers to obtain legislation (35 USC 106 of the proposed Patent Reform Act of 1967)[44] to outlaw patents for software-implemented inventions failed in the Congress. Though the legislation was nominally part of the Administration Bill and had apparently been suggested by the Report of the President's Commission on the Patent System, Assistant Attorney General Turner in

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ware technology if a larger group of individual inventors and small companies working in the vanguard of the art can obtain such patents.

43. Requests for access to the proceedings of the Commission to investigate these matters were denied by the Patent Office when the Report was published.

44. H. R. 5924 and S. 1042, 90th Cong. 1st Sess. (1967).

charge of the Antitrust Division withdrew all support for 35 USC 106.[45] The President's Science Adviser Hornig likewise withdrew support and gently discredited his own Administration's proposal, testifying: "It has become clear that there are some very genuine and difficult questions of philosophy as well as practicability involved in the patentability of computer programs."[46] The Assistant Attorney General's and the Science Adviser's testimonies followed broad-based hearings held by the Science Adviser to obtain the views of software as well as hardware manufacturers, unlike the President's Commission which did not receive the views of the software manufacturers though it did receive the views of IBM, one of whose vice presidents was a member of the Commission.

With only the Patent Office supporting the proposed 35 USC 106, it was withdrawn from all subsequent bills for reform of the patent system. Though rebuffed in the Congress, the present Petitioner and the hardware manufacturers again raise the same false factual issue of "mental processes" before the Court.

2. Copyrights. The spurious suggestion of the hardware manufacturers that software is a "writing" concerned with "language" can be best appreciated by noting that everything they say about software in this regard is true of their hardware, for the two are engineering equivalents. Just as software is concerned with "language" (for how else does a machine process or communicate data or information except by some "language"), so is hardware concerned with a "descriptive language."[47] Just as a

45. Turner's testimony was silent on Section 106, and did not carry forward any of the views set down prematurely and onesidedly in his 1966 letter quoted in BEMA's Brief (p. 11); see Hearings on H. R. 5924 Before Subcommittee No. 3 of House Committee on the Judiciary, Apr. 20, 1967, at p. 135.

46. Hearings on H. R. 5924, Ibid. at p. 160.

47. Namely, "the descriptive language of the logical design" of the hardware, *supra* note 35. For the relation of the "command language" of software programming and the logical design language of hardware programming, see Jacobs, *supra* note 2, at p. 52.

computer scientist "writes" with pencil and paper in setting down his software concepts, so he does in setting down the logic design of his equivalent hardware. Just as it would make no sense to copyright hardware (except as one wanted to protect drawings or written descriptions of it) so it makes no sense to copyright the equivalent software (other than drawings or written descriptions). Were this matter to be before the Court on a copyright infringement charge based on the infringer's use of software to direct the operation of hardware, the outlandishness of the situation would compel the question: "How can you possibly enjoin the use of a machine device or process by copyright?" The answer is: "You cannot!"[48]

The hardware manufacturers' proposal that one protect software by copyrights or by some other new statutory approach reflects their lack of interest in inventive innovation, but instead their interest in "non-inventive innovations."[49] As the Court has stated numerous times, only the exacting standards of novelty required by the Patent System to meet the constitutional standard of invention afford a basis for obtaining exclusive rights in machines and articles of manufacture.[50]

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48. The hardware manufacturers, it seems, do not actually state that copyright protection extends to use of machine device. But they do suggest that copyright protection of written records of software would somehow be meaningful protection. See *Jacobs, supra* note 2, at pp. 59, 60.

49. See Galbi, Proposal for New Legislation to Protect Computer Programming," 17 Bulletin Copyright Society of the U.S.A. 280, 281.

50. See *Graham v. Deere* (1966) 383 U.S. 1, reaffirming *Hotchkiss* (1850) 11 How. 248; *Sears v. Stiffel* (1964) 374 U.S. 826; *Mazur v. Stein*, 98 L.Ed. 630, 642. See Testimony of Jacobs, *supra* note 26, at p. 776.

IV. The finding of fact that software is a machine device and patentable will encourage innovation and competition in the computer industry and will assist in eliminating antitrust violations and their anti-competitive efforts.

The C.C.P.A. decisions[51] have found as a fact that the hardware and software combination of a programmed digital computer forms a special-purpose computer whose character is determined by the software. These decisions, in effect, acknowledge the facts of this industry, namely, that the software is the reason for buying computers. That is, the various machines structured by software out of the elementary operations of the hardware are the *raison d'etre* of the hardware. This C.C.P.A. finding of fact is a recognition of the software manufacturer's important place in the industry. By recognizing software for what it is, namely, a machine device and the control mechanism that structures a special-purpose computer system, the C.C.P.A. found no problem in granting patent protection under existing statutes. By this line of decisions, small business was given an incentive to invest in innovation.

A hardware manufacturer's prime incentives are to increase the size and quantity of the hardware that it prices and sells, and to increase the hours of use of the hardware that it prices and leases on an hourly rate. Such a manufacturer does not have an incentive to improve the quality or efficiency of the "free" software, such as may result in a smaller size, faster operation, or more efficient use of the hardware and, thereby, in reduced revenues.[52] In this context, the hardware manufacturers find it in their interest to maintain their present control of the software markets for their respective hardware, and

51. In re *Prater*, *supra* note 12; in re *Bernhart*, *supra* note 12.

52. See *PI v. IBM*, *supra* note 10; IBM did not place an improved sorting program on the market until the PI sorting program was marketed with double the operating speed.

to oppose patents for software that would offer vehicles for entering competition.

As builders and sellers of machines and machine devices, the software manufacturers are in direct competition with the hardware manufacturers for the software market, a billion dollar market [if we include the "free" IBM software] and potentially the principal market of the computer industry. Therefore, with acceptance of the fact that software is a machine device and not a mental process, the bundling of "free" software and priced hardware is an illegal tie-in.[53]

The user of computers buys or leases a computer system on the basis of the particular automatic data processing tasks that have to be performed. Software packages structure the hardware to provide the customer with special-purpose computers to perform those tasks. The hardware merely supplies a repertoire of basic operations ("instructions" or "commands"), a certain speed of performance of the operations, and a memory and other equipments for input and output.

Thus the C.C.P.A. finding of fact that the software is a machine device which structures the hardware reveals the distortion in marketing the hardware as the principal computer component, although the principal attractions for the customer are the special-purpose computers created by the software. The C.C.P.A. finding of fact helps to reorient the emphasis—its identification of the software as the structure of the special-purpose machine clarifies that in effect the priced hardware is tied to the "free" software. This is not a new approach; in the 1935 perpetual tie-in injunction against IBM, upheld

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53. Under Section 3 of the Clayton Act, *Times Picayune v. U.S.*, 345 U.S. 594 (1953); *U.S. v. IBM*, 298 U.S. 131 (1935); *Advanced Business System v. SCM*, 415 F.2d 55 (C.A. 4, 1969).

Under Section 1 of the Sherman Act, *Fortner Enterprises v. U.S. Steel*, 394 U.S. 495 (1969), *No. Pacif. Ry. v. U.S.*, 356 U.S. 1 (1958), *Washington Gas Light Co. v. Virginia El. & P. Co.*, 1970 Trade Cas. para. 73073 (E.D. Va. 1970).

by the Court,[54] IBM is forbidden from giving its tabulating machines away "free" in order to sell its punch cards. The software, which carries the structure of the special-purpose computer desired by the customer, is given away "free" in order to sell the priced general-purpose hardware.

The C.C.P.A. finding of fact that the software-hardware combination is a machine and the software a machine device also offers the basis for a substantial change of these practices that have held back the development of software so long in this industry. That is, the approach promises the necessary vehicle for enforcement of the 1956 IBM *Consent Decree*[55] and injunction against IBM, which updated the 1935 injunction. The 1956 injunction (copy of pertinent portions attached in Appendix, p. A-14) prohibits the tie-in of the different parts ("machine or device and attachments therefor used primarily in or with an electronic data processing system") of an overall computer system. The Antitrust Division of the Justice Department attempts to justify its refusal to enforce that injunction against software bundling by the argument that software does not come within the definition of "machine or device and attachments." The accompanying cry of "mental process" has a hollow ring when it serves as a support for the maintenance of long-standing violations of the antitrust laws.

This C.C.P.A. finding of fact also offers promise of enforcement of Section 3 of the Clayton Act and Section 1 of the Sherman Act, proscribing illegal tie-ins against the hardware manufacturers supporting Petitioner, who are all guilty of the bundling practice in varying degrees,

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54. *U.S. v. IBM*, Ibid. ¶4b of the decree.

55. *U.S. v. IBM*, 1956 Trade Case, para. 68245, Secs. XV(b) II(f) and II(g) (S.D.N.Y. 1956). In the pertinent portions of the *Consent Decree* set forth in the Appendix, Sec. XV(b) is the applicable injunction and Secs. II(f) and II(g) set forth the principal definitions.

and who come into this Court talking of "mental processes," "mathematics" and "writings" to disguise their anti-competitive and monopolistic practices of bundling and tying of machines and machine devices.[56]

It may be that those giant corporations who are hardware manufacturers and who together have less than 25% of the total main frame business, as against IBM's 75%, need, in order to compete, the assistance of the revenues stemming from monopolies of the software for their own main frame hardware. However, whatever that need, continuing violations of the antitrust laws through bundling cannot be countenanced. Software companies can compete in the open market with IBM, even if the giant hardware manufacturers cannot. Certainly, the closing of the IBM software market to the small independent software companies, which is the result of the failure to enforce the *Consent Decree* against IBM, cannot be justified. Moreover, as the Court said in the 1935 IBM tie-in case, there is "no tenable basis for an exception in favor of a condition whose substantial benefit to [IBM] is the elimination of business competition and the creation of a monopoly."[57]

The importance of this case to a twice-dominated computer industry cannot be tested by the value of a minor code converter patent. Thus, the finding of fact of the C.C.P.A. that software is a machine device should become a first step in opening the software sub-industry to competition. The C.C.P.A. decision that, as a machine device, software is patentable subject matter, makes it possible for small software companies to obtain patents that will aid in curbing the otherwise uncontrolled anti-competitive practices of IBM and other hardware manu-

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56. Any hardware company obtaining patents for software, since the priced hardware is tied to "free" software, would be faced with the presumption of "sufficient economic power" which is an element of the violation. *International Salt Co. v. U.S.*, 332 U.S. 392 (1947).

57. *U.S. v. IBM*, *supra* note 53, at p. 140.

facturers. Patents for software inventions will serve as an incentive for small software companies to invest in research and development for the innovative software sorely needed by all computer users and by the Government, and as a shield to market a new or improved product in competition with the "free" software of IBM. Whatever monopoly may be created by the exclusive rights of the patent grant, it is a *de jure* monopoly that will tend to limit the *de facto* monopoly that has been countenanced in the software sub-industry for so many years.

CONCLUSION

The findings of fact and conclusions of law of the Court below are soundly based, and its decision should be affirmed.

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FOLDOUTS ARE TOO LARGE TO BE FILMED

No. 71-485

IN THE

Supreme Court of the United States

OCTOBER TERM, 1972

ROBERT GOTTSCHALK, COMMISSIONER OF PATENTS,
Petitioner,

v.

GARY R. BENSON AND ARTHUR C. TALBOT,
Respondents.

ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS

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CONCLUSION 6

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IN THE

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No. 71-485

ROBERT GOTTSCHALK, COMMISSIONER OF PATENTS,
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Respondents.

ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS

BRIEF FOR RESPONDENTS

QUESTION PRESENTED

Whether a useful, novel and unobvious method for conversion in an electrical data processing machine of electrical signals representing binary-coded decimal numbers into electrical signals representing binary numbers of equivalent value is a patentable invention under 35 U.S.C. § 101?

STATEMENT

I. Background of the Invention

In the early 1960's when the respondents made the invention involved in this case they were engaged in the development of a telephone switching system of a type known as a private branch exchange or "PBX". A PBX is typically used in an office building or hotel to interconnect the telephones in a building to each other and to telephones in the outside world. To accomplish this interconnection, the PBX receives electrical dial impulses or "signals" from the telephone of the party placing the call; it identifies the particular telephone being called; and based on that identification the PBX apparatus interconnects the two telephones.

The particular model PBX being developed employed apparatus elements that, instead of being wired together in a fixed manner, could be flexibly interconnected under the control of a stored set of electrical signals.[1] The mechanism for achieving this flexibility was a device called a control unit which was similar in many respects to the machine commonly known as a digital computer. In essence, a modern digital computer is a data processing machine that utilizes electrical signals both to control its operations and to represent data within the machine. The computer stores electrical data signals and, in response to the control signals, can retrieve and organize the data signals to assemble lists, search for selected words, effect arith-

[1] For a general description of respondents' PBX see Williford, "The No. 101 Electronic Switching System," *Bell Laboratories Record*, November 1963, p. 374.

metic operations, and perform other tasks with the data signals.[2]

The control unit in respondents' PBX, while similar to a computer, was not a computer in the usual sense of the word since its basic function was limited to controlling telephone connections. Thus, it lacked many of the functional capabilities and apparatus components or "hardware" of a typical general purpose computer. However, the PBX control unit and general purpose computer are both data processing machines that operate with electrical signals and both utilize a technique known as stored program control in which the control signals may be stored within the machine itself.

When a sequence of control signals or "program" stored in the computer is set in operation, apparatus elements transfer data signals between different locations within the machine and generate, cancel, or otherwise manipulate such signals in order to perform specific programmed functions.[3] The same processing of signals could be accomplished by a fixed wired electrical circuit designed to execute prescribed functions. However, a programmable computer can store and carry out a variety of different programs and the programs themselves can be altered or replaced. The computer can therefore have a greater repertoire of

[2] A more detailed discussion of computer operations and related notation systems is contained in part I of the Appendix to this brief (pp. 1a-5a below). Part II of the Appendix contains a description of respondents' invention. Part III includes an explanation of relevant mathematical techniques.

[3] A "program" is a series of instructions that controls the operation of a data processing machine. During their preparation, these instructions may be represented in words, but they are ultimately encoded in a sequence of electrical control signals to operate the computer. See Appendix (pp. 1a-2a, below).

operations with less fixed wired circuitry, and its operations can be changed readily without rewiring the machine.

In respondents' PBX, as in most modern digital computers, only two forms of electrical signals or conditions are employed to represent all data; for example, these signals might be the "on" and "off" states of an electrical device such as a transistor or the presence or absence of an electrical pulse in a circuit. The two alternative signal conditions are often represented by the symbols "1" and "0". Different sequences of electrical signals in the computer may be regarded as representing names, letters, numbers or any other data desired by the programmer.

When the data to be stored in or utilized by a computer is numerical, it is usually convenient to represent it inside the machine by the binary numbering system. In the decimal numbering system ten digits—0 through 9—are used and a digit in each successive position left of the decimal point has a numerical or "positional" value ten times greater than it would have in the preceding position.[4] In the binary numbering system, however, all numerical values are represented only by use of the digits 1 and 0 and each successive digit left of the decimal is only twice the numerical value of the same digit in the preceding position.[5] The

[4] In this brief, "digit" refers to the individual member or members of a number and "number" includes the entire numerical expression (*e.g.*, 2 is a digit in the number 23).

[5] For example, in the decimal number 111, the first digit reading right to left has a numerical value of 1, the second of 10, and the third of 100; the value of the whole number is one hundred eleven. In the binary number 111, the first digit has a value of 1, the second of 2, and the third of 4; the value of the whole number is seven. The base or "radix" of the decimal system is thus the numerical value 10 and the base of the binary system is 2. See Appendix (pp. 3a-4a, below).

ready correspondence between the two forms of electrical signals in the computer and the two digits of the binary numbering system make binary numbers highly suitable for computer use.

Another form of notation, intermediate between decimal and binary, is called the binary-coded-decimal or "BCD" numbering system. In a BCD number, only the digits 1 and 0 are used, but a BCD number is merely successive sets of four-digit binary numbers, each set of which corresponds directly to a single digit in the decimal number being represented in BCD form.[4] It is often desirable in translating a decimal number into a binary number first to convert the decimal number into a BCD number and then to convert the BCD number into a binary number. For example, in dialing a telephone, each turn of the dial normally transmits a set of pulses representing one decimal digit. It simplifies the required circuitry if each such set of pulses is independently converted into four binary signals equivalent to the original digit. The entire sequence of signals will then represent the telephone number in BCD form. See Appendix (p. 5a, below).

II. Respondents' Invention

In the PBX telephone system with which respondents were concerned the signals transmitted from the calling telephone arrived at the control unit in BCD

[4] For example, the decimal number 53 would be expressed in BCD form as the combination of the separate binary equivalents of 5 (0101) and 3 (0011), *i.e.*, 0101/0011. Accordingly, the BCD number, although consisting of 1's and O's, is not a true binary number; this because the positional values of the 1's and O's are different than they are in true binary notation except for the first four positions in the number. The true binary equivalent of 53 is 110101. A further explanation of BCD numbering is contained in the Appendix (pp. 4a-5a, below).

form, and the machine's operation required their conversion into binary signals before interconnection could be accomplished. At the time of respondents' invention, there existed a number of different ways to accomplish this BCD-to-binary conversion of electrical signals. These included methods which rely on fixed wired electrical circuits, a number of which are patented, and methods that may be embodied in programs suitable for use in digital computers.[7]

All of the methods known to respondents for making the BCD-to-binary conversion in a digital computer required either the addition of multi-digit binary numbers or the storage in the computer of signals representing a large number of conversion values, or both. See Appendix (pp. 6a-7a, below). The first of these requirements could not be met in respondents' PBX since it did not have an "adder," which is a conventional apparatus capable of adding multi-digit binary numbers together. The second requirement was infeasible since the PBX had a limited storage capacity that could not as a practical matter be used to retain a large number of conversion values.

In studying the conversion problem respondents discovered a new method of employing a data processing apparatus to accomplish the conversion of BCD

[7] For classification purposes, all patents are assigned by the Patent Office to one of several hundred subject matter classes divided into numerous more specific subclasses. Patent Office, *Manual of Classification*. The Patent Office has an entire subclass—sub-class 155 of class 235—reserved for patents covering means of converting numbers in one type of system such as BCD to numbers in another type of system such as binary. Approximately 75 patents have been issued for means of converting between BCD signals and binary signals by the transmission of electrical signals through fixed wired circuits.

signals into binary signals. The method required the processing of the set of signals that represents the BCD number in a repetitive cycle. Each complete cycle involved the identification and elimination of one electrical signal and the introduction of two new signals at designated places in the original set of signals. This process produced at the end of the repetitive steps a set of signals representing a binary number equivalent in numerical value to the BCD number previously received and stored in the computer.

This method of conversion required neither the storage of numerous conversion values, nor the presence of a multi-digit adder. It employed existing circuits to identify or "test" signals, to eliminate or "mask" them and to "add" or increment them. The invention also took advantage of a "reentrant shift register" available in the PBX. Most computers employ a shift register of one type or another for manipulating signals, although frequently it is not of the "reentrant" type.[8] Using this device, the testing and masking function and the incrementing function could each be made to occur at a single location in the register which had certain practical advantages. Since the invented process itself is a physical one, involving the manipulation of electrical signals within the computer, its steps are most easily described in the form of dia-

[8] A "register" is a device which holds a set of electrical signals representing a limited number of digits so that they may be tested to determine the presence or absence of a pulse in a particular position, added to other digits, transferred to another location, or otherwise manipulated. A "reentrant shift register" is a register which has the capacity, in addition to holding the set of signals, to shift the entire set to the left or right so that signals that exit from one end of the shift register reappear at the other end in a cyclical pattern. See Appendix (pp. 7a-8a, below).

grams, and a complete diagrammatic description of the invention and its operation is contained in part II of the Appendix (pp. 7a-13a, below).

In inventing the process just summarized the respondents were assisted by their discovery of a particular mathematical relationship between BCD and binary numbers that had not previously been noted from which they derived a new technique for converting BCD numbers into binary form. The mathematical relationship and technique discovered by respondents, which is described in part III of the Appendix (pp. 14a-20a, below), provides an abstract explanation why the intended process works to produce a correct conversion of electrical signals representing a BCD number into electrical signals representing an equivalent binary number. The mathematical relationship and technique, however, are not the subject of any patent claim made by the respondents; they correspond to respondents' process invention in the same way that a law of chemistry corresponds to a newly invented process for producing a known medicine.

The process invented by respondents can be used generally in digital computers, although it is most useful for devices such as the PBX control unit which have limited equipment and storage capacity. The process has a basic characteristic that is highly desirable in computer operations: it can be implemented through a repetitive pattern of steps which uses the same set of electrical signals to control the machine over and over again during conversion. This not only lessens storage requirements but, for technical reasons, reduces the likelihood of mistakes in the conversion and simplifies preparation of complex programs to accomplish specific tasks.

III. The Proceeding Below

In October 1963, respondents filed an application for a patent on their process. A "process" is one of the basic statutory categories of patentable inventions. 35 U.S.C. § 101. Process patents, unlike machine or "apparatus" patents, are directed to the "process, art or method" (35 U.S.C. § 100(b)) of accomplishing a given result rather than the particular machinery or apparatus that carries out the process.[9] Indeed, "process" is defined by statute to include "a new use of a known . . . machine." 35 U.S.C. § 100(b).

Respondents' application was required by statute to include a "specification" describing the invention and the manner of making and using it and to include individual "claims" pointing out the subject matter claimed as the invention. 35 U.S.C. § 112. The subject matter of a patent is the invention, here a machine process, and not the words, numbers or concepts used in the description. Thus, the respondents' process can be described or explained with the assistance of words and mathematical operations; the process sought to be patented, however, is a physical one which occurs inside a machine and involves the generation, comparison and termination of electrical pulses in a particular way to achieve a particular end, *i.e.*, the conversion of BCD signals into equivalent binary signals.

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[9] Examples of process patents include a process for purifying flour (*Cochrane* v. *Deener*, 94 U.S. 780 (1877)); a way of extracting fat acids from glycerine (*Tilghman* v. *Proctor*, 102 U.S. 707 (1880)); a method of transmitting sounds electrically (*The Telephone Cases*, 126 U.S. 1 (1888)); a technique for making expanded sheet metal (*Expanded Metal Co.* v. *Bradford*, 214 U.S. 366 (1909)); and a process for artificially hatching eggs (*Waxham* v. *Smith*, 294 U.S. 20 (1935)).

Respondents' application described their invention as relating "to the processing of data by program and more particularly to the programmed conversion of numerical information" (R. 3). The detailed specification included a statement of the problems posed by existing conversion methods; the respondents' solution which utilized the "recurrent addition of a fixed quantity to registered signals" (R. 4); and the specific advantages of respondents' process which have been outlined above.[10] The specification contained an illustrative diagram of electrical apparatus suitable for performing the invention—relevant circuitry of respondents' PBX control unit (R. 15)—and an illustrative set of program instructions which implemented the invented process in respondents' PBX (R. 9).

The application concluded with the required statement of individual claims. The only two claims here at issue, claims 8 and 13, are set forth at R. 142-43 and reprinted in petitioner's brief (Pet. Br. 3-4, n.1). Claim 8 described a "method of converting signals" from BCD to binary form in terms that make clear that it is describing an electrical circuit process designed to be used in data processing devices. For example, the claim described steps including storage of the BCD "signals" in a "reentrant shift register," and the "shifting," "masking," and additive functions in the appropriate order (R. 142-43). Claim 13 described a "method for converting representations" from BCD to

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[10] The specification described these advantages as including among others a curtailing of the complexity of "the programming operations"; the elimination of "repetitive storing and retrieval"; enhanced accuracy "by eliminating the need for interchanging signals among various equipment components"; and accomplishment of conversion without the need for "auxiliary equipment" (R. 4-5).

binary similarly directed to an electrical circuit process, as is shown by both the words of the claim and by other considerations discussed at pp. 17-18 below.

Each claim is thus directed to a process to be performed in an electrical data processing machine. The purpose of the process is to effect BCD-to-binary signal conversions which are necessary or desirable in many computer operations in addition to respondents' PBX switching system. The application did not limit the claims to employment of the invented process in connection with telephone switching systems. While the immediate intended use of the process is in telephone switching systems, it has an advantage for computer operation in other cases where there are equipment limitations or a need to conserve storage space and reduce the likelihood of errors.

In the Patent Office proceedings, respondents' claims were considered in relation to the basic substantive requirements of the statute: proper subject matter, utility, novelty and unobviousness. 35 U.S.C. §§ 100-03. The utility of respondents' invention was not questioned at any stage. As is usual, a search was made of the relevant prior art, which here included patents issued on various means of BCD-to-binary signal conversion. See p. 6, n. 7 above. No prior art was cited against either of the claims here at issue at any point in the proceedings.[11]

The Patent Office Examiner rejected the claims here as issue on the sole ground that they covered subject matter "not embraced by 35 U.S.C. 101 in that they

[11] Rule 106(b) of the Patent Office, 37 C.F.R. § 1.106(b), requires an Examiner to specify the prior art on which he relies—*e.g.*, prior patents, scientific publications—when he rejects a claimed invention for lack of novelty or for obviousness.

set forth 'mental processes' and 'mathematical steps,' neither being an art . . ." (R. 137; see R. 135-36). The Examiner did not rest his rejection on any determination that the claims lacked novelty under Section 102 or that they failed to meet the requirement of Section 103 that the invention be non-obvious. 35 U.S.C. §§ 102-03. On appeal, the Patent Office's Board of Appeals upheld the Examiner's rejection, stating: "[W]e find we are in agreement with the position of the Examiner that the appealed claims set forth subject matter not embraced by 35 U.S.C. 101 within the term 'art' . . ." (R. 138). Once again, no suggestion was made that either claim 8 or claim 13 failed to meet the statutory standards of novelty and unobviousness.

The court below, addressing itself to the sole and precise ground for rejection adopted by the Patent Office, reversed, holding that the process claimed was directed to machine implementation and not to "mental processes" and "mathematical steps." 441 F.2d 682. The court first considered claim 8 and determined that it "covers only a machine-implemented process . . . ." *Id.* at 687. It then considered claim 13 and held that it was similarly limited because "realistically" it "has no practical use other than the more effective operation and utilization of a *machine* known as a digital computer." *Id.* at 688.

SUMMARY OF ARGUMENT

Respondents' invention is a machine process within the meaning of the Patent Act. Each of the claims is directed at the processing of electrical signals in an electrical data processing apparatus, as is shown by the wording of their claims, the specification, and other relevant considerations. Electrical signals have long been deemed proper workstuff for a patent (*e.g.*,

O'Reilly v. *Morse,* 56 U.S. (15 How.) 62 (1853), and a process as well as an apparatus claim for manipulation of electrical signals is legitimate. *E.g., The Telephone Cases,* 126 U.S. 1 (1888). The utility of the invented process is beyond question.

There is nothing in respondents' patent claims that makes them inconsistent with the proposition that an abstract idea or a series of mental steps may not be patented. The respondents have never sought to claim the mathematical relationship or technique they discovered but only the particular machine process they derived from the mathematical discovery. Such a practical application, having immediate use and specific advantages over the prior art, is the very essence of invention. See *Mackay Radio & Telegraph Co.* v. *Radio Corp. of America,* 306 U.S. 86, 94 (1939). Operations occurring inside an electrical data processing machine are not a series of mental steps.

The respondents' claims are confined to a process which is effected in a particular type of apparatus (an electrical data processing machine), which falls within a particular field of technology (data processing) and which has a particular end use (conversion of BCD signals to binary signals). There is no basis for petitioner's contention that more confining or particularized restrictions are necessary. The authorities petitioner cites—cases involving patent claims relating to the telegraph and the telephone—do not impose the narrower restrictions advanced by petitioner but in fact uphold patent claims far broader than those involved here. In data processing, BCD-to-binary signal conversion is a comparatively limited end use, and respondents' process, while possessing distinct advantages, is only one of a number of ways to accomplish such conversion.

Petitioner and amici are not at this stage entitled to object to respondents' claims on the grounds that they lack novelty, are obvious or attempt to patent the "inherent function" of a machine. These objections were not the basis of rejection in the Patent Office, were not raised or considered in the court below, and were not presented by the certiorari petition. In any event, no prior art has ever been cited by petitioner to establish that respondents' process is either not novel or is obvious, and this Court has rejected attempts to apply these standards based on a hindsight evaluation made easy by the inventors' own contribution. See *United States* v. *Adams*, 383 U.S. 39, 52 (1966). The inherent function doctrine, which is designed to prevent claims which extend to every means of producing a particular effect or result, has no application here since respondents have limited their claims to a particular set of steps that will lead to the particular result and not any other way of effecting BCD-to-binary signal conversion. See *Waxham* v. *Smith*, 294 U.S. 20, 21-22 (1935).

The policy arguments of petitioner and amici that computer processes and programs as a class should not be patentable are unsound. Patenting inventions of this kind, where they are new, useful and unobvious, will serve the traditional purposes of the patent laws: to stimulate discovery and development of new inventions and to encourage their public disclosure. The patenting of computer software will also strengthen the many small producers who currently compete in the software field with the few large corporations that also manufacture computer hardware and hold numerous apparatus patents. Neither the administrative inconvenience to petitioner of classifying patents in a new field nor the usual obligations of industry to comply with limitations imposed by the Patent Act

provide any basis for denying patents to computer processes and programs.

The policy arguments should also be rejected because they would require this Court to depart from its usual practice of judicially considering inventions on a case by case basis under the statutory standards of utility, novelty and unobviousness and would exclude in gross an entire area of technology from the protection of the Patent Act. The arguments advanced to support this exclusion are conjectural, based on disputed assertions of fact, and reflect the particular interests of petitioner and the hardware manufacturers who support him. Except in the case of atomic weapons, Congress has never excluded any area of technology from the Patent Act. The patent statute has been applied to countless new technologies as they developed and any departure from this legislative approach is a matter for Congress.

ARGUMENT

I. THE RESPONDENTS' INVENTION IS A PROPERLY CLAIMED MACHINE PROCESS WHICH MEETS THE REQUIREMENTS FOR PATENTABILITY UNDER THE STATUTE AND THE DECISIONS OF THIS COURT.

The invention made by respondents and claimed in their application is a particular method or process for use in a digital computer or other electrical data processing apparatus to convert electrical signals representing BCD numbers into electrical signals representing binary numbers equivalent in value. The claims at issue extend only to this particular machine process. They do not seek to embrace any underlying mathematical principle nor do they extend to any other method of converting electrical signals from BCD to binary form, whether by computer or otherwise.

In essence petitioner argues that respondents' process is not patentable subject matter because it is merely an idea, a mathematical principle, or a series of mental steps. The usefulness of the invented process is not questioned. Although petitioner seeks to color his arguments by references to the issues of novelty and obviousness, he does not directly and explicitly challenge the process on those grounds. Any such attack would be inadmissible because the issues of novelty or obviousness are not properly before the Court since they were not raised or relied on in the Patent Office, not argued in nor decided by the court below, and not presented by the petition for certiorari. See pp. 33-34, below. Petitioner's argument, therefore, should be considered on the assumption that the claimed process is useful, novel and not obvious.

A. Respondents' Claimed Invention Is a Machine Process Within the Meaning of the Patent Act.

Respondents' patent application shows that both claims at issue in this case are, on any reasonable construction, directed at a process to be performed within an electrical data processing apparatus such as the digital computer. This was the conclusion of the court below with respect to each of the claims (see p. 12, above) and the premise of the certiorari petition.[13] It is confirmed by an examination of their explicit language as well as the surrounding circumstances.

Claim 8 cannot legitimately be read as referring to anything other than a process performed uniquely in

[13] The certiorari petition (p. 2) as well as petitioner's brief on the merits (p. 2), described the question presented as involving the patentability of a BCD-to-binary conversion method for "use . . . in conventional general-purpose digital computers."

electrical circuitry typically found in a digital computer. The method claimed is one of converting "signals" which are the electrical impulses utilized by such computers. It is directed to the conversion of BCD signals to binary signals—a step particularly useful and necessary in the operation of computers. A "reentrant shift register," whose use is a central part of the described method, is a well-known piece of computer hardware. The steps described in claim 8 involve standard computer terminology: "storing . . . signals," "shifting signals," and masking and adding at fixed positions in the "register" (R. 142-43). Taking the claim as a whole, the lower court was clearly right in reading it to refer only to a machine-implemented process operating upon electrical signals.[18]

Claim 13 is broader than claim 8 for it is not confined to an apparatus utilizing a reentrant shift register. The claim is, however, confined to a process performed in an electrical data processing apparatus. This is true because the claim is stated in words peculiarly applicable to the automatic and mechanical operations of an electrical device ("testing" and "detected"); because of the technological fact that "the process of claim 13 has no practical use other than the more effective operation and utilization of a *machine* known as a digital computer" (441 F.2d at 688); and because of the application's description of the computer problems the invention was designed to solve and the circuitry and

[18] Petitioner's brief makes a half-hearted suggestion that the term "shift register" might comprehend a piece of paper with penciled notations on it but states that this is "immaterial" (Pet. Br. 25, n.26). The entire claim must be read as a whole and such a reading invokes computer operations at too many different points to permit any such reading.

program set forth in the specification to illustrate the process (R. 3-5, 9, 15).[14]

The respondents developed their invention as a machine process and that is the only object of their claims. Petitioner's argument to the contrary is directed primarily against claim 13. For the reasons stated above, we submit that there is no warrant for the broad construction that petitioner seeks to impose on claim 13. Furthermore, the arguments that petitioner addresses to claim 13 have no force as applied to claim 8; that claim unequivocally is confined to a process for electrically converting BCD signals into binary signals of equivalent value.

The process which respondents invented and have sought to patent—as contrasted with the mathematical relationship and technique they noted but did not claim—is a machine process. It thus is one of the types of invention that constitute statutory subject matter under the Patent Act (35 U.S.C. §§ 100(b), 101) and fall in the category of "Discoveries" relating to the "useful Arts" within the meaning of the constitutional clause (Art. I, Sec. 8, cl. 8).[15] The machine in this case is an electrical data processing machine and the process respondents have sought to patent occurs within the machine.

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[14] It is well settled that the specification may be used in construing the claims of the patent (*United States* v. *Adams*, 383 U.S. 39, 49 (1966)); and there is no reason to disregard technological realities in such construction, as petitioner's brief seems to suggest (Pet. Br. 24, n.24).

[15] It has long been settled that a machine process, like a metallurgical or chemical one, is patentable subject matter within the intent of Congress and the Constitution. *E.g.*, *Eames* v. *Andrews*, 122 U.S. 40 (1887); *Cochrane* v. *Deener*, 94 U.S. 780 (1877).

When this process is performed in accordance with the respondents' claims, various operations are performed within the data processing machine upon electrical signals. The operations include the transfer of signals from one portion of the apparatus to another, the detection and elimination of signals, and the incrementing of signals in a specific sequence of steps. At the completion of these operations, a sequence of signals arranged in one pattern has been converted into a sequence arranged in a different pattern producing a result that is highly useful in the operations of the machine.

Electrical signals are a no less proper work stuff for a process patent than flour, metal or glycerine, and a method of manipulating them is as legitimate subject matter for a patent as a method of purifying flour, expanding metal or extracting fat acids from glycerine. See p. 9, n. 9, above. The patenting of inventions involving the manipulation of electrical signals is not new or debatable. Such patents—including process as well as apparatus claims—were recognized in cases involving telegraphy, telephony, and radio.[16] The manipulation of electrical signals in digital computers for processing of data is a technological step forward but that is not a reason for treating it differently than a method of manipulating the electrical signals in telegraphy or radio equipment for purposes of communication. The patent laws, of course, embrace new fields of technology as they arise. The encouragement of such new developments is the major aim of the statute.

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[16] *O'Reilly* v. *Morse*, 56 U.S. (15 How.) 62 (1853); *The Telephone Cases*, 126 U.S. 1 (1888); *Mackay Radio & Telegraph Co.* v. *Radio Corp. of America*, 306 U.S. 86 (1939).

The electrical signals utilized in a data processing machine may be assigned numerical values, letter equivalents, names or any other meaning the user desires. The attribution of such meanings to the signals does not, however, render an apparatus or a process for manipulating these signals any the less a machine or a machine process. No one would suggest that an apparatus claim on an adding machine or digital computer was invalid merely because the apparatus contained gear wheels or electrical circuit components used in representing numbers whose ultimate significance is related to mathematical computations.[17] There is no basis in logic or authority for asserting that the attributed meanings preclude patentability in the case of a method claim but permit it in the case of a claim on apparatus. The patent sustained in *The Telephone Cases*, 126 U.S. 1 (1888), included a process claim for manipulating electrical signals whose ultimate use lay in their ability to transmit the human voice or other sounds.

Respondents, in order to render their process patentable, were not required to invent a new apparatus to utilize it so long as the process could be performed by some known means that renders it useful. Patentable processes may be and often are implemented with familiar apparatus elements. *E.g.*, *Smith* v. *Snow*, 394 U.S. 1 (1935); *Expanded Metal Co.* v. *Bradford*, 214

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[17] Indeed, fixed wired electrical circuits which perform the same basic task as respondents' process—conversion of BCD signals to binary signals—have been patented as apparatus in a large number of cases. For example, the Couleur patent (No. 3,026,035 issued on March 20, 1962) is an apparatus patent for manipulating electrical signals to effect BCD-to-binary conversion. The mathematical relationships that explain why it performs correctly are different than those relevant to respondents' process. See Appendix (pp. 6a-7a, below).

U.S. 366 (1909). Such processes may even involve merely a "new use" of a "known . . . machine." 35 U.S.C. § 100(b). See *Cochrane* v. *Deener*, 94 U.S. 780, 788 (1877). Apparatus disclosures in an application for a process claim are chiefly relevant in illustrating the operation of the process and confirming its utility. The utility of respondents' process is beyond question.[18]

B. The Patenting of Respondents' Invention Does Not Conflict With the Rule That an Abstract Idea or Mathematical Principle Is Not Patentable Subject Matter.

To support his position that respondents' patent claims should be rejected because they attempt to cover mathematical principles or formulae or mental steps, petitioner has intertwined several different arguments. He contends that the claims themselves show that respondents have sought to patent a mathematical theorem; that the claims fail to include "limitations" to a field of technology or end use which are alleged to be required as a matter of law; that the mathematical principle used by respondents in developing their invention does not "synergize" with the computer whose use is involved; and that the claims extend to unpatentable "mental processes." In the interests of clarity these various contentions should be disentangled and analyzed separately but whether considered separately or in their original entangled form they are without merit.

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[18] See generally *Brenner* v. *Manson*, 383 U.S. 519 (1966). Respondents' application disclosed a functional end use for the process (BCD-to-binary signal conversion); practical advantages of the new method over existing ones (see p. 10, above); illustrative apparatus capable of performing the process under appropriate programming (the relevant circuitry of the PBX control unit); and a specific application of the process to conversion of telephone dial signals (R. 7).

1. The assertion that respondents have sought to patent an idea (Pet. Br. 19-23) involves a confusion between the mathematical relationship and technique that respondents discovered and the useful and pragmatic appplication of the discovery in the invention that respondents have claimed in their patent application. Respondents, in the course of attempting to solve the problems created by limited circuitry and other practical constraints they faced, discovered a mathematical relationship not previously noted and derived a new mathematical technique for converting BCD numbers to binary numbers. The discovery assisted them in making the invention claimed in their application and it provides a theoretical explanation of its success. The mathematical relationship and technique are not, however, the invention claimed by respondents in their patent application.

What respondents did was to reduce their mathematical discovery to practical application in a machine process whose utility is beyond question. Respondents not only discerned the mathematical relationship and technique but they perceived how it could be applied for manipulating electrical signals in a computing apparatus in a way that would provide a solution to the particular hardware problems faced by respondents. See pp. 6-8, above. They then developed a process which allows conversion of BCD signals into binary signals to be performed in a computer without an adder device, without making the usual demands on storage capacity, and by a repetitive pattern of masking and incrementing which minimizes the likelihood of error. This sequence of discerning and reducing an abstract idea to a "pragmatic application" and "specific use" is what petitioner himself recognizes as the essence of a patentable invention (Pet. Br. 18).

Respondents have never sought to patent anything more than the invented process. Examination of their patent claims has already shown that the claims are directed to a process involving the manipulation of electrical signals performable only in a digital computer or other electrical data processing apparatus. The claims themselves thus refute petitioner's suggestion that the process claimed as invention is "nothing more than a sequence of mathematical steps" or mathematical "theorem" (Pet. Br. 20). That suggestion ignores the fact that respondents have reduced their mathematical discovery to practical application in an electrical machine process whose utility is beyond question, and have limited their claims to that machine process.

Certainly petitioner cannot deny respondents a patent on the ground that their invention is derived from or explained by an idea that may not itself be the subject of a patent claim. Every invention involves the application of abstract principles or natural laws to a specific situation, and this is equally true whether the invention utilizes laws of physics in implementing a new smelter process, implements the laws of chemistry to create a new material, or applies the laws of mathematics for development of a new process for manipulating electrical signals in data processing apparatus. This Court has repeatedly recognized that while phenomena of nature, scientific principles and natural laws may not be patented, the specific and pragmatic application or use of such phenomena, principles or laws may give rise to a patentable invention.[19]

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[19] *Mackay Radio & Telegraph Co.* v. *Radio Corp. of America*, 306 U.S. 86, 94 (1939); *The Telephone Cases*, 126 U.S. 1, 532-33 (1888); *DeForest Radio Co.* v. *General Electric Co.*, 283 U.S. 664, 684-85 (1931); *Smith* v. *Snow*, 294 U.S. 1 (1935).

Respondents' application for a patent on such a specific and pragmatic use no more "monopolizes" the underlying idea than does any other patent. Every patent restricts the application of the underlying scientific or mathematical truth in the identical method or apparatus covered by the patent, in exchange for the benefits that the patent system affords. See pp. 42-48, below. But the restrictive effect of the patent is confined to the use of the scientific principle or mathematical truth as applied in the particular method or apparatus described in the patent claims. This does not mean that the patent covers the scientific or mathematical truth itself and thereby removes it from the public domain. Others are free to use it in any way that does not duplicate the specific process or apparatus covered by the patent.[20]

In this case, respondents have not sought to patent the mathematical truths they discovered. They have claimed only a particular method derived from their discovery of those truths, *i.e.*, a series of specific steps for the conversion of BCD signals into binary signals in an electrical data processing apparatus. The underlying truths may assist in disclosing other new mathematical techniques—*e.g.*, a method for converting binary numbers to BCD numbers—and respondents' own technique may prove useful in the operation of some machine or apparatus other than an electrical data processor. A fast developing technology may well develop other substantially different means for implementing the technique that will have wide practical ap-

[20] It should also be remembered that the use of a patented article or process for experimental or instructional purposes does not constitute infringement. *Kaz Mfg. Co.* v. *Chesebrough-Ponds, Inc.*, 317 F.2d 679 (2d Cir. 1963); *Chesterfield* v. *United States*, 159 F.Supp. 371 (Ct. Cl. 1958).

plication, such as an apparatus using film, hydraulics or non-electrical machine parts. Respondents' claims will not in any way restrict the use of the mathematical technique in any apparatus other than an electrical data processing apparatus. The claims are, therefore, not equivalent in any sense to a claim of the mathematical technique without regard to the purpose or means of its implementation.

Even if it is assumed to be unlikely that in the future other practical apparatus for implementing the technique will be developed it does not follow that the claims are invalid. In *The Telephone Cases,* this Court held that the claim in issue could not be invalidated by an argument that the method described might extend to all practical means of using electricity to transmit speech.[21] In terms of its practical importance the breadth of the claim sustained by the Court in that case was far greater than the breadth of respondents' claims here. See pp. 28-29, below.

2. Petitioner's brief asserts principally that the "decisions of this Court" show that a process such as that sought to be patented here is only valid when it has limitations "both" confining it to "a particular type of apparatus or hardware" and confining "the application of the method to a specified field of technology" (Pet. Br. 23). Elsewhere petitioner suggests that the latter restriction must confine the invention to a partic-

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[21] The Court stated:

> "It may be that electricity cannot be used at all for the transmission of speech except in the way Bell has discovered, and that therefore, practically, his patent gives him its exclusive use for that purpose, but that does not make his claim one for the use of electricity distinct from the particular process with which it is connected in his patent. It will, if true, show more clearly the great importance of his discovery, but it will not invalidate his patent." 126 U.S. at 535.

ular end use within a field of technology, such as converting telephone dial signals from one form to another.[22]

This entire line of argument is founded on a misstatement of the applicable law. There is no declared general rule that a process claim which properly describes the steps of a novel and unobvious process useful in the technological arts must necessarily limit the invention to a preferred apparatus on which those steps can be performed, to one field of technology in which they find their most useful application, or to a particular purpose or end use to which the invention must be put. Nevertheless, respondents' claims here meet all of these requirments and petitioner's argument is in substance simply an assertion that the respondents' claims should have recited a different apparatus, a more limited field of technology, and a narrower end use.

The suggestion that a process claim must necessarily include an apparatus limitation is not consistent with the decisions of this Court. As long ago as *Cochrane* v. *Deener*, 94 U.S. 780, 787 (1877), this Court declared: "That a process may be patentable, irrespective of the particular form of the instrumentalities used, cannot be disputed." Nevertheless, the process claimed by respondents in this case is confined to use in electrical data processing equipment so the peti-

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[22] Petitioner employs the "end use" phrasing in its summary of argument where the claims are characterized as being "without limitation as to end use or apparatus" (Pet. Br. 15). In the argument itself, petitioner varies the alleged rule to one requiring limitations confining the process to "application . . . to a specified field of technology" and "to a particular type of apparatus" (Pet. Br. 23).

tioner's own standard is satisfied.[23] No reason or authority is provided why respondents' claims should be confined to some narrower or different class of apparatus.

Petitioner's further supposed requirements that the process be restricted to a particular field of technology and a specific end use are also met in this instance. Respondents' process obviously does fall within a field of technology—electrical data processing—which is a growing field but hardly larger than others (*e.g.*, medicinal drugs, internal combustion engines) where patents are regularly issued. The invented process also has a specific end use, *i.e.*, conversion of BCD signals to binary signals. Petitioner's own classification manual recognizes radix conversion as an appropriate function for an invention. See p. 6, n. 7, above. Thus, what petitioner seems to be arguing is that respondents' process is not patentable unless confined in application to some *other* field of technology such as telephony or narrowed further to some particular end use within the field such as converting telephone dial signals. See Pet. Br. 3, 23.

While the petitioner asserts that these requirements "emerge" from two decisions (Pet. Br. 23)—*O'Reilly* v. *Morse*, 56 U.S. (15 How.) 62 (1853) and *The Tele-*

[23] While petitioner's brief asserts that respondents' "claims" were not limited to any "particular apparatus" (Pet. Br. 3), in the same passage it seems to concede that the claims are confined to "any use of the claimed method in a general purpose digital computer" which is clearly an apparatus restriction. The petitioner elsewhere recognizes that confining claim 8 to digital computers is a restriction on apparatus (Pet. Br. 16). Thus, the statement that no apparatus restriction exists is apparently addressed only to claim 13 and there depends on the petitioner's unduly broad reading of that claim.

phone Cases, 126 U.S. 1 (1888)—neither lends any support to the alleged rule of law. Contrary to petitioner's reading, neither case even went so far as to hold that apparatus limitations are essential to machine process claims, although that point is not significant here since respondents' claims are confined to a type of apparatus.[24] Stretching *The Telephone Cases* still further, petitioner reads that decision as requiring that machine process claims embody "use limitations indicating a particular field of art" and it asserts that Bell's "claimed use was confined to telephone systems . . ." (Pet. Br. 23). Telephony, however, was obviously not the end use of Bell's invention; that invention *was* telephony (see p. 29, n. 26 below) and the end use of the telephone is any of the many purposes to which telephones may be put in countless fields of endeavor.[25]

Nothing in the language of either of the cases upholding telegraph and telephone patents ever suggested that the patentee was confined to any end use

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[24] In *Morse* the Court upheld an apparatus claim while striking down a claim so general that it described neither an apparatus nor a process but embraced any use of electro-magnetism for long distance marking or printing, whatever the method or apparatus employed. See 56 U.S. (15 How.) at 112. In *The Telephone Cases*, the Court expressly upheld both an apparatus claim and a method claim which was not confined to any particular apparatus; while two different devices were mentioned in the specification to establish utility and one was expressly claimed, the Court expressly emphasized that the patent was "not to be confined to the mere means [Bell] improvised to prove the reality of his conception." 126 U.S. at 539.

[25] On petitioner's legal theory the Bell patent should have been held invalid because it did not restrict the claimed invention of telephony to use of the telephone for certain of the many specific end uses of which it was capable as, for example, in the operation of railroad trains, the verifying of credit cards or the withdrawing of cash from banks (Pet. Br. 21).

narrower than communication. Whether such telegraph or telephone communication is applied to serve one field of technology (*e.g.*, operation of railroads) or thousands of them and whether it is put to one end use within a field (cancelling railroad reservations) or thousands of them does not make the patent more or less valid. Indeed, an entire existing subclass of patents—subclass 155 of class 235—has the same end use as respondents' invention (see p. 6, above) and radix conversion in the data processing field is a comparatively narrow end use. The breadth of respondents' claims is insignificant compared to the claims sanctioned in both of the cases cited by the petitioner.[26]

3. Petitioner appears to argue that the restriction to electrical data processing apparatus that demonstrably exists here cannot be considered in determining whether respondents have developed a patentable invention. Petitioner states that there is no contention that the "mathematical principle respondents claim synergizes with the computer" (Pet. Br. 26), *i.e.*, enhances the operation of the computer. Therefore, it is argued, restriction of the invention to computers is merely the assertion that a mathematical formula—which might be utilized in any apparatus or in the human mind—is in this instance fortuitously directed to use in a computer.

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[26] For example, in *The Telephone Cases* the Court in describing Bell's invention stated: "What Bell claims is the art of creating changes of intensity in a continuous current of electricity, exactly corresponding to the changes of density in the air caused by the vibrations which accompany vocal or other sounds, and of using that electrical condition thus created for sending and receiving articulate speech telegraphically." 126 U.S. at 533-34.

Respondents have not claimed the mathematical principle but rather a machine process developed with the aid of that principle and the process does indeed synergize with and enhance the operations of the computer. The patent application describes at length the particular hardware problems faced by respondents and how their process is a solution to those problems in several ways. In particular, the process allows BCD-to-binary signal conversion to be performed in a computer with fewer hardware devices (such as the adder), less demand on computer storage capacity, and with fewer errors. It is precisely because respondents' method of processing signals does have special utility in computers that it is clearly a useful machine process.

The citations that accompany the synergism argument (Pet. Br. 26) have nothing to do with the question of when an apparatus limitation is requisite or sufficient to reduce an idea to a patentable process. Each of the cases involved a dispute whether a combination of known apparatus elements into a new form was so new and unobvious as to constitute invention.[27] The citations and petitioner's accompanying statement that there must be "novel and unconventional cooperation" between the mathematics and the computer suggest that petitioner is really contending that respondents' process does not meet the statutory standards of novelty and unobviousness. Any such argument is neither presented by this case nor is it supported by the record. See pp. 32-38, below.

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[27] For example, in *Anderson's-Black Rock, Inc.* v. *Pavement Co.*, 396 U.S. 57 (1969), the Court held that the combination on one chassis of a heater, spreader, and other devices for blacktopping a road was not unobvious under the standard laid down in Section 103.

4. Petitioner asserts that the lower court's decision impairs a doctrine, previously accepted by the lower court and the Patent Office, that "purely mental steps do not form a process which falls within the scope of patentability as defined by statute" (Pet. Br. 29). This assertion is essentially an argument that claim 13 is overbroad because it might be read to claim both a machine process and a process relying on mental steps aided by pencil and paper or poker chips used as recording instruments (Pet. Br. 30). The argument must be confined to claim 13 because there is no reading of claim 8 that could extend it beyond its intended application, *i.e.*, to a process carried on entirely within a digital computer or other electrical computing apparatus.

Claim 8 by its own terms reads only upon a series of steps that cannot be performed oustide the confines of such an apparatus. Even if the claim were read in total isolation from the descriptions in the patent application, its steps specified "converting signals," "storing . . . signals," the use of a "reentrant shift register," the "shifting of signals," and "masking" and adding at specific "positions" of the register. This language describes nothing other than manipulations within an electrical data processing apparatus. Accordingly, there is no way in which claim 8 could be offensive to any doctrine concerning mental steps.

A proper construction of claim 13 also confines it only to the processing of electrical signals in a digital computer or other electrical data processing apparatus. See pp. 17-18, above. Even if that claim were construed to extend to other types of machinery not employing electrical signals, machinery does not perform a series of mental steps. Respondents have never sought to

patent the performance of any steps by a human being, with pencil and paper, poker chips, or any other such recording device, and the lower court has not sanctioned any such claim. Thus the questions of how far mental steps might be involved in such an operation and what involvement of the human mind in a process suffices to prevent patentability are essentially moot points.

Needless to say, any doctrine relating to "purely mental steps" has no application to the operations that occur within a computer. Computers do not "think" except by an abuse of metaphor; they are made to conduct electrical signals, just as a light bulb does, in patterns and for purposes useful to human beings. When the operation of a computer is followed step by step through performance of a specific function—such as conversion of a BCD sequence of signals into equivalent binary signals in accordance with respondents' process—it becomes apparent that the operations are as physical and inanimate as the operations of a telephone or an electrical dishwasher. See Appendix (pp. 8a-13a, below).

C. Arguments Directed to Novelty, Obviousness and Inherent Function Do Not Justify Reversal of the Decision Below.

Petitioner purports to rely primarily upon the contentions that the claims in issue are unpatentable because they cover "mental processes" or "scientific principles" but throughout his brief he embroiders these contentions with assertions, assumptions and insinuations that the claims are invalid because they lack novelty and are obvious or because they merely cover the "inherent function" of a machine (*e.g.*, Pet. Br. 20, 26, 28). Certain of the amici supporting the petitioner even more explicitly attempt to rely upon the

latter grounds of invalidity.[29] These objections to the claims will not suffice either to cure the infirmities in petitioner's other arguments or as independent grounds for reversing the judgment below. The objections raise issues that are not properly before the Court and in any event the objections are without merit.

In the Patent Office no prior art was cited against the two claims at issue and the Patent Office did not reject these claims on the ground that they covered subject matter that was not novel under Section 102 or that was obvious under the standard of Section 103. On the contrary, the Patent Office based its rejection of the claims on the sole and explicit ground that they related to "subject matter not embraced by 35 U.S.C. 101 in that they set forth 'mental processes' and 'mathematical steps,' neither being an 'art' " (R. 137). Accordingly, the court below noted that as to the claims here in issue "no prior art is cited and no question is raised as to utility, novelty, or unobviousness." 441 F.2d at 684. Quite properly, therefore, the court below did not consider or decide those questions.

Although at one stage the Patent Office Examiner objected to respondents' claims on the ground that they covered the inherent function of a machine (R. 29), he thereafter withdrew that objection and in their final rejection of claims 8 and 13, neither the Examiner (R. 135) nor the Patent Office Board of Appeals (R. 138) relied in any degree, either expressly or by implication, on the doctrine of inherent function. The point was not argued by the Patent Office in the court below and that court did not discuss or decide any questions relating to inherent function.

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[29] *E.g.*, IBM Br. 23-25 (inherent function); Honeywell Br. 15-17 (obviousness); Burroughs Br. 8-9, 1a-11a (obviousness).

Similarly the petition for certiorari did not seek review on questions of novelty, obviousness or inherent function. The petition sought review solely on the precise issue on which the Patent Office based its rejection and which was decided by the court below. Thus the petition asserted that the process here involved "is nothing more than an arrangement of arithmetical calculations" (Pet. 8); that "ideas—scientific principles, mental processes, and abstract intellectual concepts"—are not patentable subject matter (Pet. 8-9); and that "this Court has repeatedly ruled that a scientific principle, rule, formula or mathematical expression is not a patentable process, *regardless of the novelty or the importance of the discovery*" (Pet. 9). (Emphasis supplied.)

The certiorari petition did not cite Section 102 which concerns novelty or Section 103 which establishes the standard of non-obviousness (see Pet. 2), and it made no reference to the doctrine of inherent function. Read as a whole the petition shows that petitioner sought certiorari to present the basic question whether computer programs could ever be patented and not to redress mistaken applications of the novelty or obviousness standards as applied to particular claims. In these circumstances we submit that for present purposes the claims here at issue should be considered on the assumption that they meet the requirements of novelty and non-obviousness and are not invalid under the inherent function doctrine.[29]

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[29] Generally this Court will not consider issues not presented in the petition for certiorari or not presented and argued in the court below. *General Talking Pictures Corp.* v. *Western Electric Co.*, 304 U.S. 175, 177-78 (1938) (issue of anticipation and lack of invention not presented by petition); *Neely* v. *Eby Construction Co.*, 386 U.S. 317, 330 (1967). If the judgment below

Even if the novelty and non-obviousness of respondents' invention were open to attack in this Court, the arguments that petitioner addresses to these questions are without merit. Petitioner's suggestion that the claims here in issue lack novelty and are obvious rests upon the assertion that respondents "seek a patent grant on a theorem" that follows "automatically" from the mathematical definitions of binary, decimal and BCD numbers and from the axioms of binary addition and multiplication and that the theorem itself is "elementary" (Pet. Br. 20). The "theorem," however, is not the invention claimed by respondents and there is no proof of any kind that either the theorem or the invention claimed is elementary.

Here respondents discerned a previously unnoted mathematical relationship and derived a new mathematical technique for converting BCD numbers to binary form; they perceived that the technique could be significant and useful in devising a process for accomplishing BCD-to-binary signal conversion in an electrical data processing apparatus; and finally, they devised such a process which not only is a practical application of the technique but actually enhances the operation of the apparatus. As we have shown above the invention claimed is the process and not the mathematical relationship or technique used in devising the process. To establish that the claims in issue lack novelty and are obvious, petitioner must establish that respondents' invention was anticipated by the prior art or was so slight an advance that the invention "as a whole" would have been "obvious at the time the in-

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should be affirmed, the case will proceed in the Patent Office pursuant to the lower court's judgment and the Patent Office will not be precluded from further considering issues relating to novelty, obviousness and inherent function before any patent issue.

vention was made" to one with ordinary skill in the relevant art. 35 U.S.C. § § 102-03.[30]

Nothing in the record in the Patent Office or in petitioner's brief provides even a colorable showing of this kind. Although the conversion of BCD signals to binary signals had for years been the subject of investigation in the computer field and even though over 75 patents covering means of conversion between such signals have been issued (see p. 6, n. 7, above), the Patent Office was not at any time able to cite any prior art against the claims. See *United States* v. *Adams*, 383 U.S. 39, 52 (1966). Thus there was no citation of any prior art that even suggested that the discovery of the mathematical relationship used in respondents' process was "elementary." Certainly there was no evidence that the invention taken as a whole—starting with the recognition of the mathematics and concluding with the invented process—lacked novelty or was obvious.

Amicus IBM also attacks the novelty and unobviousness of respondents' invention by arguing that respondents' discovery of a "mathematical principle" must be disregarded because it is unpatentable and that the subsequent application of the principle to electrical data processing was a "simple step" that does not rise to the level of "inventive dignity" (IBM Br. 23). IBM re-

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[30] This statutory language, and the cases that have construed it, make clear that this determination cannot proceed by fragmenting the invention into parts which are themselves simple nor can it be based on a hindsight evaluation made easy by the very knowledge the inventor has contributed. See *United States* v. *Adams*, 383 U.S. 39, 51-52 (1966); *Walt Disney Productions* v. *Fred A. Niles Communications Center, Inc.*, 369 F.2d 230, 234 (7th Cir. 1966); *In re Sponnoble*, 405 F.2d 578, 585 (C.C.P.A. 1969).

lies principally upon the *Funk Bros. Seed Co.* v. *Kalo Inoculant Co.*, 333 U.S. 127 (1948), where the Court rejected claims relating to a product that merely combined in a single package certain strains of known bacteria that the inventor had found to be compatible. The combination added nothing to the natural physical qualities or efficacy of the individual strains and on this ground the Court held that a product patent could not be sustained.[31] It stated that it was not passing on any claim for a process useful in selecting particular strains of bacteria that might be compatibly combined. 333 U.S. at 130.

Here respondents do not claim any pre-existing physical materials as a product but instead seek a patent on a process which achieves a function by means that did not pre-exist in nature and had not been anticipated by prior art. See *Waxham* v. *Smith*, 294 U.S. 20, 32 (1935). Respondents did not only discover an unnoted mathematical relationship between positional values in BCD notations and those in binary notations, but they employed their discovery to invent a machine process, *i.e.*, a specific set of steps for converting BCD signals into binary signals in an electrical data processing apparatus. This process did not exist either in a purely physical sense or in the mind of man until it was conceived and implemented by respondents. In these circumstances the *Funk* decision has no appli-

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[31] Thus the Court emphasized that the combination of species "produces no new bacteria, no change in the six species of bacteria, and no enlargement of the range of their utility. Each species has the same effect it always had. The bacteria perform in their natural way. Their use in combination does not improve in any way their natural functioning. They serve the ends nature originally provided and act quite independently of any effort of the patentee." 333 U.S. at 131.

cation.[32] There is, moreover, no basis for asserting that the reduction of any underlying mathematic principle here involved to the claimed machine process was itself obvious in light of the prior art.

Petitioner's reference to the doctrine of inherent function involves misconceptions of the decisions of this Court and of the claims here in issue (Pet. Br. 28; see also IBM Br. 23-25). What the decisions of this Court show is that the mere "result" or "effect" of a machine is not a method and hence is not patentable so that if a claim that purports to define a method is found in fact to claim the result or effect of a machine's operation it is invalid. On the other hand, if the claim defines the acts or steps that lead to the desired result or effect it is a valid process claim, assuming that the other standards of patentability are satisfied.[33] The inherent function doctrine, properly understood, was designed to preclude process claims which by claiming broadly the effect of a machine's operation attempted to extend the patent monopoly to other means of accomplishing the same result which the inventor had

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[32] To read *Funk* as broadly precluding consideration of the totality of an inventor's contribution including relevant aspects that may not themselves be patentable would make it inconsistent with the reasoning of this Court in cases both preceding and following *Funk*. See, *e.g.*, *Eibel* v. *Paper Co.*, 261 U.S. 45, 66-68 (1923); *United States* v. *Adams*, 383 U.S. 39, 52 (1966).

[33] The earlier decisions of this Court dealing with process patents show that the doctrine of inherent function was directed against claims on effects masquerading as claims on process. Thus in *Expanded Metal Co.* v. *Bradford*, 214 U.S. 366, 383 (1909), this Court, in discussing the doctrine, equated "the mere function" of a machine to the "effect of the operation of a machine." See also *Cochrane* v. *Deener*, 94 U.S. 780, 787-88 (1877); *Corning* v. *Burden*, 56 U.S. (15 How.) 252, 268 (1883).

not described or even conceived and which he could not therefore properly claim as his invention.[34]

Any process implemented by machine must, if the process works, employ a machine "inherently" capable of performing the required "function." Plainly this cannot preclude patentability of the process so long as the inventor limits himself to claiming the process he invented and not every other means of securing the same result. The Court made this clear in *Waxham* v. *Smith,* 294 U.S. 20 (1935), which upheld a process claim for incubating eggs. The process involved the use of an incubator, racks, chains and other apparatus all of which merely performed their mechanical functions. The Court rejected an argument that the claim was an improper attempt to patent a function performed by the apparatus stating: "But the function which a machine performs, here the hatching of eggs, is to be distinguished from the means by which that performance is secured." 294 U.S. at 21.

In the present case the claims in issue describe acts or steps that result in the desired function or effect. They do not purport to cover broadly the effect itself, *i.e.,* the conversion of BCD signals to binary signals,

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[34] The principal decisions in this Court bearing on the inherent function doctrine are discussed and analyzed in *In re Tarczy-Hornoch,* 397 F.2d 856 (C.C.P.A. 1968). Contrary to the suggestion of petitioner (Pet. Br. 28) and of IBM (Br. 25, n.31) the Court of Customs and Patent Appeals in that case did not reject any rule laid down by this Court in its decisions; it held that other lower federal courts had misinterpreted those decisions by requiring a showing that a claimed machine process could be performed in some manual fashion or by apparatus other than that disclosed in the application. 397 F.2d at 864, 866. Whether *Tarczy-Hornoch* was correct or not is irrelevant here since respondents did show their process could be performed in more than one electrical apparatus (R. 15, 39).

by attempting to claim all methods or processes for achieving that effect in a computer. The claims are confined to the particular acts or steps that they set forth and leave open the conversion of BCD signals to binary signals in a computer by any and all processes except that specifically set forth. The fact that the acts or steps described in the claims are intended to cause a digital computer or PBX control unit to perform functions of which it is capable does not bring the claims within the scope of the "inherent function" doctrine. It was equally true that the method patent in *Waxham* was directed to the performance of functions that the apparatus was designed and constructed to perform. The decisive point here, as in *Waxham,* is that the claims set forth all of the steps necessary to secure a result by a method which is novel, useful and non-obvious.[35]

II. THE VARIOUS POLICY ARGUMENTS THAT COMPUTER PROCESSES AND PROGRAMS AS A CLASS SHOULD NOT BE PATENTABLE ARE UNSOUND AND ARE NOT A VALID GROUND FOR DENYING PATENT PROTECTION TO RESPONDENTS' INVENTION.

Petitioner and the amici who support him advance a variety of policy arguments that they assert require reversal of the judgment below. In large part those arguments assert opinions and preferences which we believe are erroneous and which, in any event, rest upon assumptions of fact that have not been examined in

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[35] There is a basic incongruity in any attempt to apply the doctrine of inherent function to a programmable electrical data processing apparatus. Such a machine has no inherent function apart from the execution of directions which cause it to perform certain mechanical operations. Without directions, it is inert. Respondents' claims do not preempt any inherent function of the machine. On the contrary they set forth a process that gives the machine a function that it would not otherwise possess.

this or any other judicial proceeding and have never been scrutinized or accepted by Congress. They represent an invitation to this Court to bend the particular standards of patentability established by the statute in order to accommodate the administrative convenience of petitioner and the private interests of the computer manufacturers who support him.[36]

A remarkable characteristic of these arguments is that they seek a sweeping declaration that would deny patentability to an entire class of inventions—computer processes and programs—without examining particular applications and without regard to the utility, novelty and unobviousness of the individual inventions.[37] Yet Congress, with a single exception (see p. 64, below), has not excluded fields of technology from the statute but has designed standards generally applicable to all inventions on a case by case basis. The policy arguments seeking a broad scale exclusion from the statute are therefore arguments more appropriately addressed to Congress than to this Court and they are, in any case, without merit.

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[36] Three of the amici supporting the petitioner—IBM, Honeywell, and Burroughs Corp.—are major manufacturers of computers and related hardware, while the Business Equipment Manufacturers Association is a trade association whose members include "the nation's leading manufacturers of computers and computer-related equipment" (BEMA Br. 2).

[37] The phrase "computer processes and programs" is used here to embrace processes such as that of respondents, devised principally for use in a special purpose electrical data processing apparatus, and those—sometimes loosely described as "programs"—devised principally for use in general purpose digital computers. In either instance it is the machine process that may be patentable; neither respondents nor any other participant in this case has suggested that the written or otherwise recorded description of the process can be patented. See p. 9, above.

A. The Patenting of Inventions Such as That of Respondents Will Serve the Normal Ends of the Patent System.

The various policy arguments of petitioner and amici are notably for their repeated, and sometimes explicit, refusal to give due consideration and weight to the long established congressional policy in favor of providing patent protection for new, useful and unobvious inventions. Thus, petitioner, in urging a construction of the statute that would deny all patents in an entire field of technology, suggests that patents are antithetical to our national policy and that administrative convenience is a ground for denying an otherwise proper patent application (Pet. Br. 32-33). The same philosophy permeates the briefs of amici.

The patent system was sanctioned by the framers of the Constitution, established by the first Congress (1 Stat. 109) and has been maintained with its basic elements intact virtually throughout the nation's history. The present statute is a considered determination by Congress that every "process, machine, manufacture, or composition of matter" which meets the statutory standards of novelty, usefulness and non-obviousness should be given patent protection. That policy has thus been an integral part of the Federal Government's approach to technology for almost two centuries and it has been applied to new technologies as they have developed. It cannot be brushed aside or ignored as petitioner and amici seek to do.

The reasons that underlie the policy of patent protection are directly relevant here. It is elementary that the patent system has two basic purposes. First, it provides an incentive to the inventor to produce, and the investors to develop, new inventions and thus encourages both technological advances and the wider use

of new developments; and, second, by requiring the patentee to disclose his invention to the public it widely disseminates knowledge of new scientific discoveries and technological advances and thereby stimulates additional research, development and invention.[38]

The close relationship between the two general purposes of the patent system is apparent. Without patent protection for a limited period of time, the technological advance if disclosed could be utilized freely by anyone, yet the incentive to invent and develop could hardly be maintained if subsequent users could employ and profit from the invention without recompensing those who made the invention and ran the investment risk of its development.[39] Inventors may be able to protect the fruits of their efforts in one degree or another by cloaking the invention with secrecy or curtailing its potential use. While that may preserve some incentive to invent and develop, it does so by depriving the public of the benefits that flow to it from patenting: "full disclosure of the patented invention and its dedication to the public on the expiration of the patent."

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[38] *Scott Paper Co.* v. *Marcalus Co.*, 326 U.S. 249, 255 (1945); *United States* v. *Dubilier Condenser Corp.*, 289 U.S. 178, 186-87 (1933); *Grant* v. *Raymond*, 31 U.S. (6 Pet.) 218, 241-42 (1832); *Report of the President's Commission on the Patent System* 1-3 (1966), reprinted in S. Doc. No. 5, 90th Cong., 1st Sess. (1967).

[39] See W. Leontief, *Essays in Economics* 216-22 (1966): "[W]ho would pay for a good which, once it has been produced, becomes available to everyone in an unlimited amount? Why not wait until someone else pays for it or invests in its production and then have a free ride? . . . The patent, the copyright, and the licensing laws take care of this. They provide the quantity dimensions for objects which intrinsically have none and thus make it possible for private enterprise" to engage in invention as in any other productive activity. *Id.* at 218.

Scott Paper Co. v. *Marcalus Co.*, 326 U.S. 249, 255 (1945).

Measured against the purposes of the Patent Act, computer processes and programs which are useful, novel and unobvious are in exactly the same category as any other inventive advance. For "the general policies behind the patent system apply to computer programs as well." Comment, 54 *Cornell L. Rev.* 586, 602 (1969). "Software," the term used in the computer industry to embrace computer processes, programs, and related materials, has as much need for patent protection as the computer hardware with which the software cooperates. The lack of assured protection to date, because of petitioner's opposition, has produced the very ills the patent system was intended to prevent.

Software's need for patent protection is obvious. On the one hand, thousands and even millions of dollars may be expended in developing a single computer process or program, just as such sums are often expended in developing a new chemical process or machine apparatus.[40] On the other hand, it is not likely to cost more than a few dollars—perhaps $50 for an entire lengthy program—to copy or duplicate a process description or computer program which can then be converted to the copier's use in the absence of patent protection. Copyright, for reasons explained below, cannot even if available provide meaningful protection

[40] See Comment, 54 *Cornell L. Rev.* 586, 589 & n. 17 (1969). A single program may involve thousands of man hours. *Id.* Much of a program's development cost may be expended on routine operations. Yet very substantial time and expense may be spent in developing an aspect of the program or a basic method that, although it may be briefly described, is the essential inventive advance and may be central to the entire program.

for an inventive process or program. See p. 48, below. Thus, if real stimulation is to be provided for the further development and dissemination of computer processes and programs, there is no adequate substitute for the protection provided by the Patent Act.

The argument for protection is not answered by suggestions that production of new programs has been adequate in the past despite the legal uncertainty of patent protection (*e.g.*, BEMA Br. 10). There is a widely held view that there are deficiencies in software production, and that its development has lagged far behind the hardware side of the computer business.[41] Moreover, the patent system is designed to produce more and better invention, whatever the current rate of technological growth.

The main beneficiaries of patent protection are, of course, numerous software companies, many of whom are small independent enterprises, for whom programming is the central line of business. Computer programming is in fact a field where basic advances may still reasonably be expected not only from small companies but from the private individual inventor possessing expert skill. Many of these companies recognize the need for and the advantages of patent protection for computer processes and programs. See, *e.g.*, *Bus. Week*, Oct. 21, 1967, p. 178. Indeed, a principal trade association of software companies including over thirty such companies—the Association of Data Processing Service Organizations-Software Products and

[41] See, *e.g.*, Statement of Dr. Ruth M. Davis, *Hearings of the Government Activities Subcommittee of the House Committee on Government Operations*, May 16, 1972, pp. 12-13; Bender, "Computer Programs: Should They Be Patentable?," 68 *Colum. L. Rev.* 241, 247-48 (1968); *Electronic News*, May 8, 1967, p. 36.

Service Section—has filed a brief amicus curiae supporting affirmance of the judgment below in this case.[42]

The second general function of the patent system is to discourage secrecy and promote the dissemination of new inventions and the ideas that underlie them. In the absence of patent protection, the inventor has a strong interest in limiting the knowledge of his invention by contract, trade secret methods, and other means that prevent the invention from being as widely known and used as it might otherwise be. To obtain a patent, however, the inventor must make a public record of his invention in the patent application which must include a description that teaches the invention to others. 35 U.S.C. § 112. This disclosure is the price the patent system extracts for the time-limited patent that it affords the inventor. Where disclosure is made through the patent system, others may usually use the invention under license and, when the patent expires, without charge. Unnecessary and wasteful duplication of efforts directed to the same problem may be avoided. Others may build upon the patented invention to develop improvements that are themselves patentable. Most importantly, the underlying insight or perception of the invention is made available for whatever other applications may be made of it by others and the universe of knowledge is expanded.

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[42] In a separate amicus brief urging affirmance, another software company, Whitlow Computer Systems, Inc., explains (p.2, n. 2):

> "It has been Whitlow's experience that the financial community views investment in the software industry with justifiable apprehension because it is not certain whether computer programs will be accorded the benefit of the patent system. Whitlow believes that many potential investors refused to invest in Whitlow simply because it could give no assurance that its computer programs will be held to be patentable subject matter."

This independent and important benefit of the patent system may be illustrated by reference to the present case. Bell Telephone Laboratories, Inc., the assignee of the patent application here involved, is quite unlike the usual software manufacturer since it is not engaged in the business of selling computer processes and programs to the general public, its patents are freely licensed, and it has independent incentives to invent not applicable in the normal case, *i.e.*, the use of the developed process in the telephone system.[43] The primary interest of Bell Telephone Laboratories, which is essentially a research organization, lies in the public disclosure of new developments in the field that will result if processes and programs are patentable. Then Bell Telephone Laboratories as well as other developers of software will have an opportunity to seek licenses to use the processes and programs that might otherwise be cloaked in secrecy and the disclosure of the concepts and ideas that underlie patented processes and programs will assist Bell Telephone Laboratories and others in making new and additional developments in the field.

In an attempt to protect their proprietary interests, many software producers have resorted to a variety of devices and practices to maintain the secrecy of

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[43] All patents of Bell Telephone Laboratories are subject to compulsory licensing at reasonable royalties by virtue of the provisions of a consent judgment entered in *United States* v. *Western Electric Co.*, 1956 CCH Trade Cases ¶ 68,246, pp. 71,139-40 (D. N.J. 1956). Virtually thousands of licenses have been issued pursuant to that decree.

Various of the amici supporting the petitioner here—see, *e.g.*, IBM Br. 2, n.1; Burroughs Br. 2—already have licenses that will automatically permit them to use the processes involved in this case should a patent issue.

their new developments including the usual trade secret measures, restrictive license agreements, and coding of their programs to permit use without knowledge of the underlying method.[44] It is generally recognized that this secrecy has wasted time and scarce resources in duplicative development and has essentially retarded progress. Necessarily, "if the only available form of protection is secrecy . . . program hoarding will reduce the utility of new programs and choke off the sort of technical dialogue that nourishes the art." Bender, *supra*, at 246. If patent protection is available, however, the software manufacturer has every reason to make and publicize fundamental improvements in programming whose cost can be repaid by licensing them to a number of different users.

Adequate protection of new inventions in this field cannot be furnished by copyright. Even assuming that computer processes and programs are protected by the Copyright Act, the copyright and patent laws aim at protecting quite different interests. Only the *form* of expression is protected by copyright,[45] and use of the described process or method that would be protected under the Patent Act is not covered by copyright. Whether the copyright laws apply at all to written descriptions of computer processes or programs is

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[44] Bender, "Computer Programs: Should They Be Patentable?," 68 *Colum. L. Rev.* 241, 245-46 (1968); Kohler & Moshman, "Patent Protection for Computer Software: Implications for the Industry," 12 *Idea* 1109, 1115 (1969). For example, IBM's standard License Agreement for IBM Program Products used in licensing its software provides that the licensee may not make the software available to others ("Protection and Security" clause) and it restricts the number of copies the licensee may make for its own use ("Permission to Copy" clause).

[45] *Baker* v. *Selden*, 101 U.S. 99, 103 (1879); *Mazer* v. *Stein*, 347 U.S. 201, 217 (1954). See generally Note, 64 *Colum. L. Rev.* 1274, 1285-86 (1964).

unsettled as petitioner concedes (see Pet. Br. 33, n.32) but the very emphasis of copyright upon the mode of expression makes it ineffective to protect a true invention.

The petitioner himself recognizes that the process invented by respondents would in different computers be described differently by different specific written programs. See Pet. Br. 9, n.11. It would be relatively easy to utilize the respondents' process or, indeed, any truly inventive program, without duplicating the form of expression. Thus there is no merit to the argument that patent protection should be denied because "programs are already entitled to copyright protection" (Burroughs Br. 22). Even amicus IBM does not pretend that the copyright statute is an adequate method of protecting programs (IBM Br. 31-32).

Despite the fundamental importance of the policies represented by the Patent Act, and their direct application to the present invention, it is suggested by petitioner that patent protection is in some broad sense antithetical to public policy. Petitioner attempts to support this suggestion by citation of a wholly inapposite decision of this Court (Pet. Br. 33).[46] The plain

[46] *Deep South Packing Co.* v. *Laitram Corp.*, 40 U.S.L. Wk. 4575 (May 30, 1972). That case held that a combination patent protects the patentee only against the operable assembly of the whole combination and not the manufacture of its parts. *Id.* at 4578. The Court observed that this rule was "firmly embedded" in the patent law by decisions antedating 1952 when Congress revised the patent statute without giving any indication that it desired to change the rule. *Id.* The language quoted by petitioner was used by the court in making the point that in the circumstances it would not change long-established law without an indication of congressional intent. Petitioner cannot and does not contend here that there is any line of decisions holding that computer processes and programs are *per se* unpatentable, much less that Congress has given any indication of accepting or approving such a rule.

implication of petitioner's suggestion is that patent protection for computer processes and programs would be fundamentally inconsistent with the general policy against monopoly expressed in the antitrust laws. To invoke the policy against monopoly to support petitioner's arguments here, as amici also attempt to do, betrays a basic misunderstanding of the patent system. As the Attorney General's Committee to Study the Antitrust Laws stated:

> "By protecting such investment [in new, patented inventions]—and thereby encouraging new technologies—the patent seeks to increase competition by what is superficially an inconsistent grant of monopoly, but is in fact a mechanism intended to assure competition in invention." *Report* 25 (1955).

Given the present structure of the computer industry the granting of patents on computer processes and programs will stimulate, not restrict, competition. The production of computer hardware is highly concentrated. The few large companies that dominate that field are essentially preoccupied with the manufacture and sale of computer hardware, although until recently they have also dominated the software field as well.[47] The emerging software industry, however, presents a different picture; it is comprised of a large number of different enterprises, many of whom are

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[47] IBM alone possesses about 70 percent of the computer market (*Wall St. J.*, Aug. 3, 1972, p. 2); and, although data is hard to obtain, its share of the software market is very large. Until recently, computer manufacturers generally "gave" their software to the purchasers of their hardware. See Comment, 54 *Cornell L. Rev.* 586, 587-88 (1969). Such arrangements have recently been challenged under the antitrust laws, and increasingly the manufacturers have begun to lease their software separately. *Id.*

small (see ADAPSO Br. 3, n. 4), who have no interest in the production or distribution of computer hardware but who compete with the hardware companies in the production of computer processes and programs. The survival of such companies in the data processing field depends entirely upon their competence and skill in producing computer processes and programs. These software companies are precisely the enterprises whose competitive power will be increased by patent protection for useful, novel and unobvious advances in programming and processing.

The provision of patent protection for software will not only secure to the smaller companies the rewards of their inventions but will allow them to compete more effectively with the large hardware manufacturers who still possess a very large, though declining, share of the software market. Such patent protection would merely be equivalent to that already possessed by the manufacturers who are strengthened by the numerous patents they hold on elements of computer hardware. Software innovation by smaller, independent companies is especially valuable because, by contrast to the hardware manufacturers, the software companies' incentive to produce innovative, highly efficient software cannot be dampened or deflected by a predominant concern with the revenues to be obtained from the leasing or sale of extremely expensive computer hardware.

New and improved computer processes and programs are likely to be more efficient because they accomplish new results or the same results by fewer steps, with simpler mechanisms and in shorter time. For example, respondents' own process dispenses with the need for an adder capable of cumulating multi-digit binary numbers and lessens the amount of storage capacity that

must be provided for the computer.[48] Thus, new and inventive computer processes and programs can reduce the necessity for more complex and very expensive equipment or shorten the valuable time required for computer operations.[49] In this way the competition stimulated by patent protection benefits not only the software industry but the countless users of data processing in industry, government and in the public at large.

B. The Inconveniences That It Is Alleged Will Follow the Patenting of Computer Processes and Programs Are Overstated and Largely Unreal.

The petitioner and amici summon up a host of ills and evils that they allege will result unless this Court declares a broad and absolute judicial ban on the patenting of computer processes or programs. The dangers and difficulties invoked are not the same but in each case reflect the particular interests of the parties. While the petitioner opposes patentability because of the alleged cost and administrative inconvenience for

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[48] See also the incident described in Bender, "Computer Programs: Should They Be Patentable?," 68 *Colum. L. Rev.* 241, 247-48 n.29 (1968), in which employees of a computer user devised a program that allowed the more efficient use of certain IBM hardware without the need for additional software called an "emulator" also available from IBM. IBM, which had asserted that the program could not be developed, licensed the emulator for fees up to $6000 per month; the program was made available for sale for $9000 in total and was more efficient than the emulator as well.

[49] For example, one of IBM's most recent models of computer—Model 370/168—is reported to cost $93,000 to $170,000 for a month's rental and from $4.2 million to $7.3 million for purchase, depending on the amount of storage capacity required. *Wall St. J.*, Aug. 3, 1972, p. 2.

the Patent Office, amici assert that their hardware customers will be hampered in using the computers. Indeed, certain of the amici make suggestions, remarkable from companies whose growth and success has been so enhanced by numerous patents on hardware components, that patentability could well have "a crippling effect" on the industry (Burroughs Br. 3; see also BEMA Br. 28).

All of these assertions made by petitioner and the amici proceed from the unspoken, and fundamentally unsound, assumption that thousands of patents on computer processes and programs will be issued unless the entire field of technology is judicially carved out of the patent statute. There is nothing in the record here, in any legislative investigation, or in common experience which gives any support to this assumption. The standards of the Patent Act and the decisions of this Court applying those standards demonstrate that the assumption bears no relation to reality.

Those decisions have emphasized the height of the hurdles that an inventor must overcome to meet the statutory standards of utility, novelty and unobviousness. See *Graham* v. *John Deere Co.*, 383 U.S. 1 (1966); *Brenner* v. *Manson*, 383 U.S. 519 (1966). Of the great number of computer programs assembled each year in this country, the overwhelming majority are laborious but routine applications of well-known techniques and the resulting programs would be done in essentially the same way by other programmers. In most cases such programs could not under any circumstances surmount the unobviousness requirement that is established by statute, and for the same reason the programs could not command a substantial price if

patented so there is no incentive even to attempt to patent them.[50]

However, the exceptional processes and programs which are useful, novel and unobvious are important and deserve protection. When a major advance occurs through a truly inventive perception, it may have an extensive effect in improving computer capabilities, lessening the time and expense demanded by computer hardware use, reducing the need for apparatus elements, or otherwise promoting the advance of technology in the field. The high standard of invention, imposed by Congress and applied by this Court, assures that there will not be any improvident issuance of patents for inventions that do not pay their way in utility and inventiveness.

Apart from this initial false assumption about the scale of program patenting and its attendant problems, the problems themselves look far less substantial on careful scrutiny. Certainly this is true of petitioner's argument that patentability should be denied because expense and inconvenience will be caused to the Patent Office in developing a system of classification, searching, and filing for computer programs and processes. This is a truly amazing argument from an agency established by Congress expressly to implement the patent laws. There can hardly have been a new field

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[50] See the brief for Iowa State University Research Foundation, Inc. as amicus curiae (p. 12):

> "Of all the large number of computer programs that are written at Iowa State University, only a very small number indeed is ever considered for possible patenting. Those programs which are directed to the solution of ordinary record-keeping or computational problems are not considered as patentable because they do not rise to the level of invention called for in 35 U.S.C. 103, as interpreted by the courts."

of technology, from industrial dyes in the last century to computer hardware in this one, that has not required careful attention from the Patent Office and some expansion and adaptation of the classification system. If this line of argument were followed, the very purpose of the patent system to encourage new technologies would be frustrated at the start.

The petitioner's own activities disclose the weakness of his argument. As his own brief admits, the decision below and its predecessors have encouraged the Patent Office to undertake the development, in cooperation with the National Bureau of Standards, of techniques for classifying and searching the computer programming art (Pet. Br. 31). Comparable projects have already been successfully instituted by private users.[51] The Patent Office has established a new class in order to provide for computer program inventions, and a number of patents have issued in this class in compliance with the past decisions of the court below.[52] As previously noted, there already exists a class for devices that perform exactly the same function as respondents' process in the subclass of patents covering means of radix conversion. In short, "the potential for a workable classification system seems to be there if the Patent Office wants one." Bender, "Computer Pro-

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[51] An organization of users of IBM equipment and software called SHARE, Inc., formed and carried on with the cooperation of IBM, has developed its own system of classifying software and uses it in operating a "program library" for its members. SHARE Reference Manual (1971). Other private classification systems are unquestionably in use.

[52] Class 444 embraces patents directed to "Programmed Data Processors, Data Processing Methods and Procedures." Approximately 38 patents have been placed in this class to date.

grams: Should They Be Patentable?," 68 *Colum. L. Rev.* 241, 251 (1968).

The Patent Office argument overlooks the fact that classification of computer programs will be necessary whether or not such programs are themselves patentable. As we have noted at p. 3, above, in many instances a particular innovative advance may be embodied either in a computer program or in computer apparatus. In order to determine whether hardware apparatus is obvious in light of the prior art it is often essential to examine the prior art relating to computer programs and processes. "[E]ven if some defined area of computer programing technology were made 'non-statutory' the Patent Office would still have the burden of classifying and researching the computer programing literature because of the close interplay between the hardware and software technologies." Statement of George F. Metcalf, *Hearings before Subcommittee No. 3 of the House Committee on the Judiciary on H.R. 5924,* 90th Cong., pt. 2, at 644 (1968).

Petitioner's practical objection to patentability is doubtless made with the utmost sincerity, but it is a familiar argument that the courts have long learned to view with skepticism. "[E]xperience indicates that the grim forebodings which are frequently expressed . . . regarding the possibility that a particular decision will cause irreparable disruption of the administrative process only rarely, if ever, come to pass." *Medical Committee for Human Rights* v. *SEC,* 432 F.2d 659, 675 (D.C. Cir. 1970), *vacated as moot,* 404 U.S. 403 (1972) (footnote omitted); *accord, Office of Communication of United Church of Christ* v. *FCC,* 359 F.2d 944, 1006 (D.C. Cir. 1966). There is no reason why the patenting of computer processes and programs should

require any greater readjustment of agency procedures than the patenting of inventions in any other new field of technology including computers.

The individual amici present a more varied range of "policy" arguments. Some of them, in contending that freedom of thought and science must not be abridged, rest on a mistaken notion of the scope of respondents' claims and, particularly, on the previously refuted suggestion that claim 13 extends to mental processes and calculations (see, *e.g.*, IBM Br. 12-13 & n. 15). Certain additional arguments made by one or another of the amici—notably the argument that the programming operations would be moved abroad if held patentable here—do not deserve serious consideration.[53] At the core of the amici's basic arguments there appear to be three main contentions.

One contention made principally by IBM is that because many mathematical discoveries are so complex that they can be practically implemented only by a computer, mathematical research and development would be stifled if patents are allowed on computer processes and programs (IBM Br. 12-19). A patent

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[53] This argument, made by Burroughs (Br. 18-19) and BEMA (Br. 28-29), appears to suppose that companies will transmit their information abroad for processing in countries that do not provide computer program patents. Such maneuvers, while potentially possible for any product that is not or cannot be patented in another country, are singularly unlikely in the realm of computer operations. Almost every result obtainable from a computer can be derived through a variety of methods including ones that have long been in the public domain. It would be quite extraordinary to have a situation where the expense and inconvenience of processing in a foreign country overcame both the disadvantages of using an unpatented approach and the alternative of paying a license fee to use a more efficient one patented in this country.

does not, however, preclude the use of an invention for scientific research and educational purposes. See p. 24, n. 20. Furthermore, only a specific and practical application of a mathematical principle to the useful arts can be patented—and then only if it meets the severe statutory standards of utility, novelty and non-obviousness—so the patenting of computer programs and processes cannot give rise to wholesale preemption of mathematical discoveries.[54] Finally, the use of a mathematical technique that can be implemented by a computer is as limited by patents on the computer as by any program or process patent, and there is no warrant for any suggestion, least of all from IBM, that computer patents have stifled scientific research and investigation.

A second argument is that the computer industry is now a burgeoning one where information including programs have been freely exchanged and that its growth should not be hampered or handicapped by the necessary costs of purchasing programs (BEMA Br. 9-16). The problem with this position is that there is substantial evidence that software has not grown adequately and that secrecy has hampered development. See pp. 45, 48, above. It is also a misconception to suppose that the patenting of programs means that the user must now pay for what he formerly had without cost. "An inventor deprives the public of nothing

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[54] In this connection it should be observed that it is far from clear that the examples IBM gives in its brief of "significant mathematical discoveries . . . inextricably related to computer programming" (Br. 13) have any apparent ability to improve computer operations. Since IBM's brief does not attempt to describe specific applications of the mathematical principles to computer operations, it is impossible to determine whether *any* such application might meet the statutory requirements for patentability.

which it enjoyed before his discovery, but gives something of value to the community . . . ." *United States* v. *Dubilier Condenser Corp.*, 289 U.S. 178, 186 (1933). Through patenting and disclosure of the invention, it becomes available to the prospective user at a price; if the use of the invention is not worth the price to the user, he need not pay it.

The final line of argument is that severe administrative burdens would fall upon the *users* of computers, typically businesses in industries other than computing, who are not equipped to determine whether the programs they utilize might infringe patents previously issued. In fact, as one amicus suggests, by indemnification contract or otherwise ultimate responsibility is likely to be imposed on the organization that prepares the program, which means the hardware manufacturers or the independent software houses who currently are the sellers.[46] The alleged burden can hardly be significant for the hardware manufacturers in view of their size and resources and their experience in dealing with similar problems that arise by reason of patents on computer hardware. So far as concerns the software companies, there are grounds for concluding that they are not alarmed by the problems that the amici hardware manufacturers assert will arise. Indeed, the fact that one major trade association in the

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[46] Burroughs Br. 21-22. Indemnification contracts are, of course, widely used in broadcasting, publishing, the manufacture of parts by subcontracting, and other fields where potential copyright and patent liability may exist, in order to assure that responsibility is lodged where it belongs. IBM's standard License Agreement for IBM Program Products specifies that, subject to certain limitations, IBM will defend and pay damages resulting from copyright or patent infringement suits brought against the licensee using an IBM furnished program ("Patent and Copyright Infringement" clause).

software industry has filed an amicus brief supporting the patentability of computer processes and programs is a powerful indication that software companies believe that any burdens that may be imposed upon them will be outweighed by benefits.[14]

All patents involve limitations on the use of what has been invented and the system necessarily imposes searching requirements on those who chose to operate in the field. The basic legislative judgment has been made, however, that it is worth paying the price and bearing the inconvenience that may accompany patents because of the benefits derived from them. If in any single field or subject actual experience shows that the burden exceeds the price, Congress is free to alter the law and exclude the field. It is notable that it has rarely seen fit to do so.

C. The Case by Case Procedure Prescribed by Congress for Passing Upon Patent Applications Should Be Followed Unless and Until Altered by Congress.

The policy arguments of petitioner and amici suffer from an infirmity even more basic than their disregard of the rationale of the Patent Act and their overstatement of the difficulties that attend any system of patent protection. Most of their policy arguments are detached from and independent of both the particular standards Congress has established in the Patent Act and the specific invention involved in this case which meets those standards. Stripped to their essence the arguments of petitioner and amici ask this Court to exclude a given field of technology from the protection

[14] As a practical matter, processes or programming advances so significant and important as to merit patents are not likely to be duplicated accidentally by the user or adopted by him from some other source inadvertently and in ignorance of the patent.

of the Patent Act, not because the statute as drafted excludes inventions in the field, but because petitioner and amici believe, for reasons of convenience and expediency, that it *should* not cover such inventions.

The design of petitioner and his supporting amici is apparent not only from the very nature of many of the arguments, including those that rest explicitly on the interests or convenience of the Patent Office and the hardware manufacturers, but also from much of the reasoning and authority drawn on in the briefs to support the arguments. For example, the brief of amicus BEMA (p. 20) asserts that the decision below is "in conflict with" the 1966 *Report of the President's Commission on the Patent System* recommending against the patentability of computer programs. See also Pet. Br. 31. What BEMA fails to explain is that the *Report* never asserted that the present statute precludes patentability. In fact, the recommendation was included as part of a proposal for Congress to enact new legislation on patentable subject matter and stated that "the classes of patentable subject matter shall continue as at present, except" that design and botanical-plant patents as such shall be eliminated and computer programs shall not be considered patentable.[37]

Amici's disregard of Congress' existing statute is also manifest in the references to practice in foreign countries (IBM Br. 26-29, BEMA Br. 26-29). Some of those countries provide patent protection for com-

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[37] *Report* 12. The Commission was composed generally of high governmental officials and prominent private citizens, including an executive of amicus IBM, and did not purport to make a full analysis of existing law. In the brief discussion of computer programs the *Report* stated that "uncertainty" exists whether such programs are now patentable. *Id.* at 13.

puter programs and others do not. As we point out at pp. 65-66, below, the public policy of foreign countries is relevant, if at all, only in legislative terms and reliance on those policies is therefore an indication that petitioner and amici seek a result that should be achieved only by congressional action. The French Patent Law may provide that "programs" for use in computers shall not be patentable (IBM Br. 26, n. 32). The Patent Act enacted by Congress contains no such provision.

There are particularly persuasive reasons why this Court should not undertake a major modification of the Patent Act of the kind requested by petitioner and amici. The request is fundamentally misguided because it invites this Court to pass upon the patentability of inventions that are not before this Court and to frame a broad and far-reaching rule of exclusion in the absence of any semblance of adequate information. Any examination of the cases in the lower court involving computer-related processes is persuasive that such inventions cannot be sensibly categorized with any simple label whether it is "computer program" or any other. The inventions involved range from process inventions that employ computers in forming two-dimensional illustrations based on three-dimensional objects; methods of processing seismograms or performing spectrographic analysis of gases; and, in one case, a method of locating one particular electrical signal in a stream of such signals.[58] Whether these inventions relate to patentable subject matter and meet the stand-

[58] *E.g., In re Bernhard*, 417 F.2d 1395 (C.C.P.A. 1969); *In re Musgrave*, 431 F.2d 882 (C.C.P.A. 1970); *In re Prater and Wei*, 415 F.2d 1393 (C.C.P.A. 1969); *In re Mahony*, 421 F.2d 742 (C.C.P.A. 1970).

ards of usefulness, novelty and non-obviousness are questions that cannot be decided in gross but instead require case by case analysis of the particular nature of the invention involved.

The approach urged on this Court by petitioner and amici is also unjustified because it would require this Court to proceed in a highly technical area on the basis of factual assumptions that are disputed and to accept particular arguments of policy from the range of conflicting views held by informed experts. The discussion in this brief of the policy arguments made against the patenting of computer programs shows their conjectural nature and the questionable assumptions on which they rest. Such arguments, whatever their apparent merits or demerits, are not a sound foundation for prescribing patent policy in an entire field based on the facts of a single case.

There is no warrant for suggesting that the issuance of the particular patent here involved will have an adverse effect upon petitioner, the individual hardware manufacturers who appear as amici, or the computer industry. The invention is a useful one but only one of a number of alternatives available to achieve BCD-to-binary signal conversion in a digital computer. The theory that this case should decide whether "computer programs" as such are patentable is based on a false notion that each of the inventions loosely labeled in this fashion should be treated in the same way under any of the statutory criteria. While any decision of this Court must provide guidance in many other cases, the sound tradition of treating each invention on the basis of the particular facts should not be abandoned here.

Nothing in the decisions of this Court supports any attempt to narrow or confine the constitutional and statutory concept of "invention" to exclude either apparatus or processes *en masse* in any designated field of technology. The phrase, adopted in an age of agricultural tools and elementary machines, has been found applicable to chemical processes, electrical methods and apparatus and the most advanced scientific fields of technology available today. None of the Court's decisions have ever suggested that each new technology requires an amendment of the statute in order to sanction patents for it (compare, *e.g.*, Pet. Br. 32-33; Burroughs Br. 24-25; IBM Br. 31-33).[59] In each new technological field, this Court has examined the invention itself to determine whether the standards of utility, novelty and non-obviousness have been met.

The case by case approach to patent applications is the approach devised by Congress and followed by it with the rarest exceptions throughout the several revisions of the basic patent legislation. There is, in fact, only one field of invention that Congress has excluded as such from patent protection—inventions solely useful in producing atomic weapons.[60] In two other cases, design and plant patents, Congress has provided spe-

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[59] The term "invention" is, in this respect, an expansive one which is not to be compared with the more precise and limited subject matter for which copyright is available. Compare *White-Smith Music Co.* v. *Apollo Co.*, 209 U.S. 1 (1908).

[60] See 42 U.S.C. § 2181(a). The policies that have led to this exclusion obviously have no bearing on this case. Where patented inventions useful generally in the atomic energy field are used in atomic weapons, the patent does not extend to this use. 42 U.S.C. § 2181(b). Congress has, however, substituted a system of awards to provide compensating incentive in such cases. 42 U.S.C. § 2187 (b)(3).

cial statutory rules for these special fields while retaining the basic concept of patentability. See 35 U.S.C. §§ 161-173. This not only shows that Congress is fully capable of treating fields of endeavor separately under the Patent Act when it wishes to do so but confirms that such special treatment is a rare exception to the basic policy of Congress to apply general statutory standards to determine the patentability of specific inventions.

The policy arguments framed by petitioner and amici are thus "misaddressed" and ought properly to be "addressed to Congress." See *Lauritzen* v. *Larsen*, 345 U.S. 571, 593 (1953). Proposals to exclude patents relating to computer programs have in fact been made, although with no success to date. See Pet. Br. 32. At the very least, however, these proposals normally contain some statutory provision that would adequately define the type of invention excluded from protection. How those definitions would apply in particular cases —including the process involved in this one—depends on their particular terms.

The patent area is not one that Congress has neglected, nor has it been unwilling to alter the statute as circumstances advise. There was a major revision of the statute in 1952 and bills for a further revision have recently been introduced and considered.[61] If there is any substance to the arguments made by amici, Congress is fully able to respond to them. It may be doubted, however, whether there is anything so extra-

[61] The Administration bill introduced to implement the recommendations of the 1966 Commission (see p. 61, above) contained a provision denying patentability to computer programs. After hearings were held on the bill, the provision was omitted from subsequent versions. See Pet. Br. 32-33.

ordinary and peculiar about inventions of the type here involved that Congress will abandon the general standards that have covered so many diverse and ingenious inventions in the past.

The presence of a particularized statutory system and Congress' continuing oversight makes the reliance of amici on the practice of foreign countries especially unpersuasive. No matter what policy those countries might adopt, the patent system in this country is a statutory one and foreign practice is at best a precedent of interest to Congress. However this may be, the practice abroad is varied and several important countries (*e.g.*, England, Canada, Germany) do in fact appear to offer patent protection for computer processes and programs. See brief of amicus Mobil (pp. 37-42); Pet. Br. 34, n. 33.

CONCLUSION

For the reasons stated, the judgment below should be affirmed.

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APPENDIX

APPENDIX

1. Computer Operation and Related Forms of Notation

The modern digital computer is a highly versatile device that can be employed to manipulate data provided to it in a variety of different ways. The data may represent names, numbers, addresses, dictionary words, or any other information. Normally the data is stored and organized in the computer in the form of electrical signals and the electrical signals are manipulated in the computer to perform various functions such as organizing names and addresses in a particular order, effecting computations with the numbers, or achieving a translation from one language to another.

Computers have a number of distinct features including a potential for vast data capacity, extremely high speed of operation and—most pertinent here—"stored program control." Stored program control is a technique used since the mid-1940's in which a sequence of electrical control signals is stored in a retrievable form within the computer for the purpose of controlling the operation of the computer itself to perform a particular function. These control signals, in contradistinction to signals representing the data to be processed, effect two basic types of control: (1) they effect the transfer of signals to be processed from one part of the machine to another, and (2) they effectively reconnect, by opening and closing electronic switches, the various hardware components of the machine so that a wide variety of operations can be performed with a common set of apparatus components.

A series of control instructions is commonly known as a "program." Each step in this series may be described in ordinary English text (*e.g.*, "shift the data in register D to the right three places in the register"). It is then written in one of several "computer languages" (*e.g.*, "SHR 3"). By means not here relevant the program

is ultimately converted into a sequence of electrical signals and stored within the computer. The program thus identifies a set of control steps which can be performed in the computer in the pre-determined pattern. The data to be processed is, of course, also introduced and processed as electrical signals.

The use of stored program control is not restricted to machines whose primary purpose is to perform arithmetic computations. It is also used to control chemical plants, machine tools and telephone switching systems such as that of respondents. These special purpose applications may use apparatus elements or "hardware" which differ substantially yet all involve the manipulation of data signals under the direction of stored program control signals in the manner just described.

Although the computer can be used to obtain results that could also be achieved independently by an individual in his mind or with a pencil and paper, it is a misnomer to regard the computer as if it "thinks" in any human sense. The computer is a machine in which electrical signals are manipulated in accordance with programmed steps predesignated by an individual. If the most efficient use is to be made of the computer, then the programmed steps normally differ substantially both in substance and in sequence from the steps an individual would follow if seeking to obtain the same result with a pencil and paper.

A digital computer stores and utilizes all of its data in the form of discrete electrical signals. Thus a discrete signal or sequence of such signals may represent a person's name, instructions, numbers, or any other data. The work stuff of the computer, therefore, is sequences of electrical signals which, in turn, represent the basic data the user wishes to organize, store and retrieve, or otherwise process.

If the electrical signals are to represent numbers, the numbers could be represented in decimal form; for exam-

ple, each decimal digit could be represented in a computer by one of ten levels of voltage in an electrical device (*e.g.*, a transistor). Most computers are designed, however, to record and utilize numbers in binary form wherein all numbers are expressed by sequences of the digits 1 and 0 rather than by the conventional 10 digits of the decimal system (*i.e.*, 0 through 9). Among other reasons for the use of binary numbers is the fact that it is more efficient to store and utilize electrical signals in a computer where this can be done with only two states, such as the "on" and "off" states of an electrical device rather than 10 states.

In the binary system digits have different "positional values" than they have in the decimal system. The positional value is the numerical value that a digit has because of its location in a particular position in a number. Thus in the decimal system, the positional values of the digits in the number 111, reading from right to left, are respectively 1, 10, and 100, *i.e.*, ascending powers of the "base number" or "radix" 10. In the binary system, by contrast, each digit is assigned positional values based on ascending powers of the base number 2, increasing from right to left as follows:

128 64 32 16 8 4 2 1

In binary notation, the decimal number 1 is represented by placing a 1 in the first position and a 0 in all other positions as shown in the following table which, for convenience, contains the positional values above each digit:

128	64	32	16	8	4	2	1
0	0	0	0	0	0	0	1

The decimal number 3 is written in binary notation by placing a binary 1 in the first and second positions as follows:

128	64	32	16	8	4	2	1
0	0	0	0	0	0	1	1

Similarly, the decimal number 53 is written in binary notation by placing a binary 1 in the first, third, fifth and sixth positions as follows:

128	64	32	16	8	4	2	1
0	0	1	1	0	1	0	1

The data the programmer wishes to store in the computer is often most conveniently available in the form of a decimal number rather than a binary number. For instance, a series of social security numbers may be intended for storage in a computer memory; similarly, a standard telephone number employs decimal digits. Since the normal digital computer stores and utilizes the data in the form of binary signals (see p. 3a, above), the decimal digits of the social security or telephone number must be converted into binary form.

This conversion is often simplified, for reasons explained below, by employing a two step process in which the number is first converted from decimal to another number form called binary-coded-decimal or BCD form and then converted from BCD form to binary form. In the BCD system, as in the binary system, only the digits 1 and 0 are utilized. The positional values of the digits, however, are different. Thus, a given sequence of 1's and 0's will represent one numerical value if it is read as a BCD number and a different numerical value if it is read as a binary number.

To convert a decimal number to BCD form, each digit of the decimal number is separately converted to its binary equivalent expressed as a set of four binary digits; the sets of binary digits placed in sequence *are* the BCD number. Thus, the decimal number 53 is represented in BCD notation by combining the binary equivalents of the decimal digits 5 (0101) and 3 (0011) into the BCD number 0101/0011. This sequence is not a true binary number because the positional values of the digits differ from pure binary notation (where

the decimal number 53 would be expressed as 110101). The positional values of the first eight BCD digits are:

80 40 20 10 / 8 4 2 1

It will be observed that the first four positions from the right are assigned the same values as in binary notation, but that the next four positions (and all positions thereafter) have different values. Any number less than ten is therefore written the same in both the binary and the binary-coded-decimal notation. For example, the number three is the same in both notations.

80	40	20	10	8	4	2	1
0	0	0	0	0	0	1	1

However, the BCD number ten is different from the binary number ten (1010). In BCD notation, ten is represented by:

80	40	20	10	8	4	2	1
0	0	0	1	0	0	0	0

As noted above, the BCD number fifty-three is written:

80	40	20	10	8	4	2	1
0	1	0	1	0	0	1	1

The reason for converting decimal numbers to BCD form before conversion into binary numbers arises from the fact that it is often convenient or necessary to convert separately each decimal digit one at a time. For example, in a telephone each turn of the dial transmits a set of pulses representing one decimal digit. If each set as it arrives at the control apparatus is converted into a group of four binary signals equivalent to the original digit, then the entire sequence of signals after all the pulses have been converted represents the original telephone number in BCD form. The second step of the conversion, from BCD to binary form, can then be effected in a number of different ways. It would require more elaborate circuitry to store each set of pulses as it arrived and then to convert all of the sets directly into the final binary sequence.

II. Respondents' Invention

At the time respondents made the invention involved in this case, there were a number of different known ways of converting electrical signals representing BCD numbers into signals representing equivalent binary numbers. One important method of conversion prior to respondents' invention involved the storage in the computer of a range of conversion values. A conversion value for purposes of BCD-to-binary-conversion is the binary number representing the positional value of a given BCD digit. Thus, the conversion value for the fifth digit in a BCD number whose positional value is 10 is the numerical value 10 expressed as a binary number, *i.e.*, 1010.

Using stored conversion values the computer would be programmed to retrieve from storage the signals representing the conversion values for the successive digits in the BCD number to be converted; for each position of the BCD number (after the first four) in which a 1 rather than a 0 appeared, the appropriate conversion value would be added to the first four digits (which are already in pure binary form). The sum of these conversion values would be taken by the steps of binary addition, and the resulting number would be the pure binary equivalent of the original BCD number.

This method required that the computer be equipped for multi-digit addition and also utilized substantial storage space in the computer's electrical memory. Both of these requirements presented substantial difficulties for respondents because the PBX telephone system they were developing lacked a multi-digit adding device and had only limited storage capacity. A further disadvantage of the existing method was that it tended to require the movement of many different signals representing different conversion values and each movement increased the possibility of error through circuit failure.

A number of other computer conversion techniques were also available, one of the most significant being the technique claimed in the Couleur patent which is described in

the brief of amicus Mobil (p. A11). Among other difficulties the Couleur technique required the computer to possess a circuit for subtracting electrical pulses representing the numerical value 3 and a circuit for detecting electrical pulses representing numerical values of 8 or more. Respondents' PBX possessed neither of these circuits.

Based upon the discovery of a mathematical relationship which is described below (pp. 14a-20a) respondents invented a new, useful and unobvious way of converting signals representing BCD numbers into signals representing equivalent binary numbers. The process required neither a multi-digit adder nor a large amount of computer storage capacity. Furthermore, it did not need either of the circuits utilized in the technique covered by the Couleur patent. It permitted conversion to be made with the relatively simple mechanisms available in the PBX and it reduced the possibility of error from circuit failure by reducing the number of necessary signal communications within the PBX.

In essence, the invented process accomplished conversion of the signals representing the BCD number by subjecting the signals to a series of repetitive steps in a particular pattern. In each complete cycle, the computer would "test" (identify) the signal at a position in the register (which is a device to contain the BCD signals to be converted); if the test identified a pulse (representing the digit 1) it would "mask" (erase) the pulse; and, in that event, it would "add" (increment) at each of two register positions predesignated in the sequence of signals representing the BCD number.

Through the use of a reentrant shift register, the set of signals being converted would in fact be shifted past the testing, masking and incrementing circuits rather than having separate circuits to perform each function at each separate position of the register containing the sequence of signals. The reentrant shift register is merely a type of register that allows a sequence of signals in the register to be shifted to the left or right in such a way that signals

exiting at one end of the register reappear in correct order at the other end of the register. See diagrams at pp. 9a-10a, below. The use of the register further facilitated the conversion process invented by the respondents.

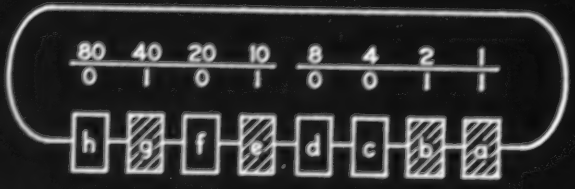
When a sequence of signals representing a BCD number is stored in a register for conversion, the signals in the first four register positions at the right need not be converted since the BCD and binary notations are identical in the first four positions. To convert the signals in the next four positions, the sequence of steps involving testing, shifting, masking and incrementing is performed on the signals initially located in the fifth through eighth register positions, one signal at a time. After these steps have been performed, those signals have been converted into a sequence of signals representing the equivalent binary number and have been cumulated with the existing signals originally stored in the first four positions of the register. This entire sequence of signals represents a binary number equivalent in value to the BCD number previously represented in the register.

The operation of the process can be graphically represented by diagramming the reentrant shift register and following the process through each of the steps necessary to convert a set of eight signals from BCD form into binary form. In the diagrams pictured below, the testing and masking operations are always performed at the second ("b") position and the incrementing is always performed at the first ("a") position. These circuits can therefore be permanently fixed to these registers.

The reentrant shift register can be pictured as follows:

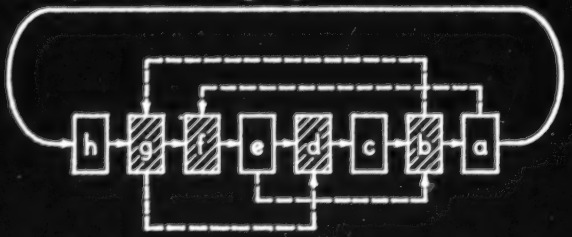
The eight boxes, a through h, are called digit registers and are each capable of holding one binary signal, usually represented by the presence or absence of a particular kind of electrical signal.

The reentrant shift register can be used to store binary or BCD numbers simply by storing the appropriate electrical signals in the digit registers. An example is the BCD number representing 53, as shown below, with the presence of a signal indicated by cross-hatching in the appropriate boxes. Storing these BCD signals in the reentrant shift register corresponds to step (1) of claim 8 of respondents' patent application ("storing the binary-coded-decimal signals in a reentrant shift register"):



The reentrant shift register shifts electrical signals to the right or to the left by moving each signal condition to the digit register to the right or left, respectively, of its starting position. Signals shifted out of one end of the reentrant shift register are inserted into (reenter) the other end of the register. For example, the second step of respondents' claim 8 calls for "shifting the signals to the right by at least three places, until there is a binary '1' in the second position of said register." This step requires a test at register b to determine if a binary 1 is actually present after the shift has occurred. If no binary 1 is present, shifting continues until a binary 1 is present in register

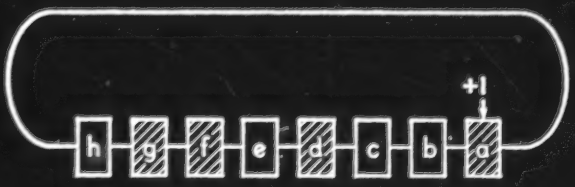
b. In this example, only three shifts are required. When this is done, the following signal conditions exist:



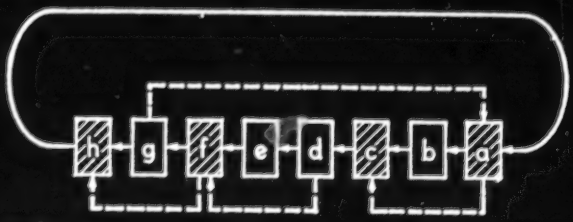
The dotted arrows indicate the movement of each signal. Thus, the signal in register a was moved three places to the right (out of the right end and into the left end) to register f; the signal at register b was moved three places to the right (also out the right end) to register g; the signal in register e was moved three places to the right to register b; and the signal in register g was moved three places to the right to register d.

The third step of claim 8 calls for "masking out said binary '1' in the second position [b] of said register."

The fourth step of claim 8 requires "adding a binary '1' to the first position [a] of said register" as follows:

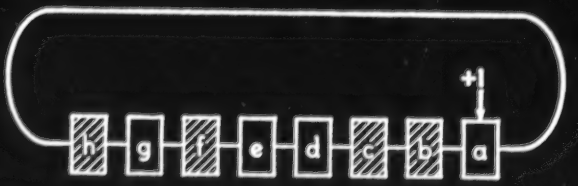


The fifth step of claim 8 calls for "shifting the signals to the left by two positions" as follows:



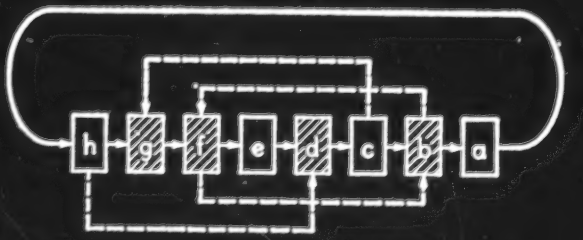
The dotted arrows represent the actual movement of the signals.

The sixth step of claim 8 calls for "adding a binary '1' to said first [a] position" of the register:



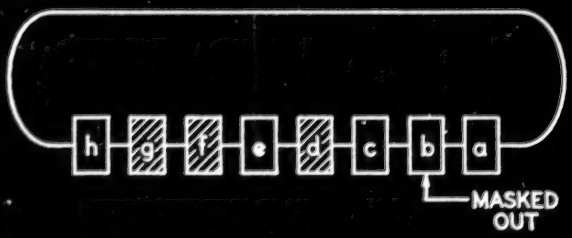
Register a is not shaded because the addition of a binary 1 to that register, which already contains a binary 1, causes a carry to register b which is therefore shown shaded.

The seventh step of claim 8 calls for "shifting the signals to the right by at least three positions in preparation for a succeeding binary '1' in the second [b] position of said register." In our example, the signals must be shifted to the right *four* positions to bring the succeeding binary 1 to the second position of the register:



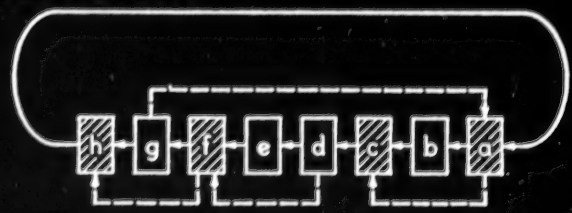
The dotted arrows again indicate the overall movement of each signal.

The conversion is completed by repeating from step (3) onward. This requires masking out the signal in the second (b) position:

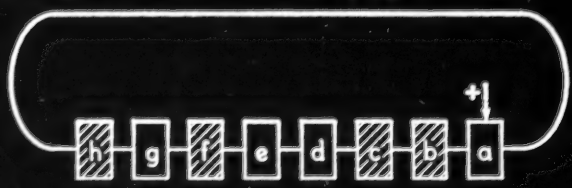


and then adding a binary 1 in the first (a) position:

The signals in the shift register are then shifted to the left by two positions:

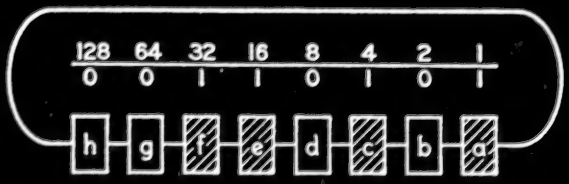


and a binary 1 is added to the first (a) position:



Again, register a is not shaded and register b is shaded due to the carry from the addition.

As a final step, the signals are shifted to the right by five places (or to the left by three places) to produce the final result:



which represents 53 in binary notation.

The register may, of course, contain more than eight positions and the BCD number may have a numerical value that requires more than eight signals. The repetitive steps of respondents' invented process suffice ultimately to convert signals representing a BCD number to signals representing an equivalent binary number no matter how many BCD signals are initially stored in the register. See pp. 17a-20a, below.

III. The Mathematical Discovery

Respondents were assisted in developing their machine process invention by a new mathematical discovery they made in the course of their efforts to solve the problem of converting BCD into binary signals in their PBX control unit. This discovery involved the ascertainment of certain relationships between given BCD numbers, their binary equivalents, and the steps for converting one into the other; and from these relationships, the respondents derived a new way of converting any BCD number into its binary equivalent.

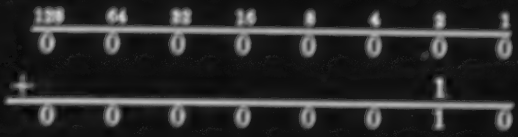
When respondents made their discovery, there already existed a number of different mathematical techniques for converting BCD numbers to binary numbers. A familiar

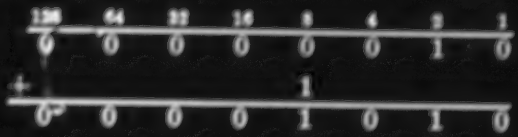
way of converting by hand is described in the petitioner's brief (p. 12, n.14). In this method, each four-digit BCD number (after the first four digits which need no conversion)—corresponding respectively to the original tens position decimal digit, the hundreds position decimal digit, and so on—is converted in turn from a BCD number into an equivalent binary number by the rules of binary multiplication. The sum of the first four digits and of all of the converted numbers, now in binary form, is taken by the rules of binary addition.

Thus, to convert the BCD number representing the decimal number 53, the BCD number in the tens position, *i.e.*, the BCD number representing the decimal digit 5, would be converted into the pure binary number representing the numerical value 50 through binary multiplication of the BCD number representing 5 (0101) by the binary number representing its positional value, *i.e.*, 10 stated in binary form (1010). The resulting binary number would be added to the existing number representing the decimal digit 3 (which is the same in binary and BCD form) to produce the result. This technique can be applied, in the manner described above, to BCD numbers of any length.

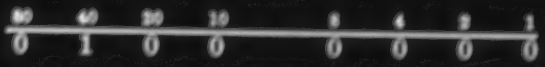
In translating BCD numbers to equivalent binary numbers, it has already been noted that the BCD and binary expressions are identical in the case of all numerical values of 9 or less. See p. 5a, above. The problem of conversion, therefore, begins with BCD numbers representing numerical values of 10 or more. What respondents discovered, in deriving their novel technique, was that all BCD numbers could be converted into binary numbers of equivalent values by the addition of binary 1's in a particular sequence at designated positions.

The individual digits of the tens positions of a BCD number can be separately converted to binary notation in the following manner. A 1 in the BCD 10's position:

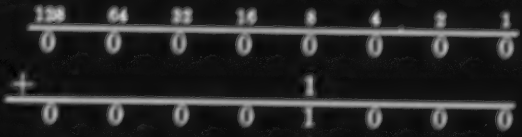
can be converted to binary notation by adding a 1 at the 2's position:

and then adding a 1 in the 8's position.



A 1 in the BCD 20's, 40's and 80's positions can be similarly converted. For example, a 1 in the 40's position:



can be converted to binary notation by adding a 1 at the 8's position:



and then adding a 1 in the 32's position:

In considering such conversions, respondents first noted that it was possible to convert *all* BCD numbers using repetitive additions of binary 1's. Respondents also noted that the additions of 1's for all conversions took place at regularly spaced binary positions removed by a fixed number of positions from the 1's being converted. This discovery, made by respondents and not available in the prior art, provided a direct relationship between any BCD number and the equivalent binary number.

As an example, the BCD number having the value 53:

can be converted to binary notation by first noting that the units value 3 needs no conversion:

The BCD value of 50:

can be converted as noted above. First, the 1 in the position having a BCD value of 10 is converted by adding a binary 1 to the 2's position as follows:

and then adding a binary 1 to the 8's position:

Second, the 1 in the position having the BCD value of 40 is then converted by adding a binary 1 to the 8's position as follows:

128	64	32	16	8	4	2	1
0	0	0	0	1	1	0	1
+				1			
0	0	0	1	0	1	0	1

and then adding a 1 to the 32's position:

128	64	32	16	8	4	2	1
0	0	0	1	0	1	0	1
+		1					
0	0	1	1	0	1	0	1

to complete the conversion.

Any other BCD number can be converted in a similar manner. To convert a BCD number having hundreds positions, it is necessary to first convert the hundreds to tens, and then to convert the augmented tens positions to units positions.

As an example, the BCD number representing 253:

800	400	200	100	80	40	20	10	8	4	2	1
0	0	1	0	0	1	0	1	0	0	1	1

can be converted to binary notation by noting that the 1 in the 200's position must first be converted to the tens positions and added to the pre-existing value of 5 in the tens positions. This is accomplished with steps similar to those noted above as follows.

It should be first noted that the BCD value of 50 is expressed in the tens positions as follows:

1280	640	320	160	80	40	20	10
0	0	0	0	0	1	0	1

(The extra four positions (160, 320, 640, 1280) are provided to permit the tens positions to be augmented or increased as the conversion process proceeds.)

The 1 in the position having a BCD value of 200 is converted by first adding a binary 1 to the 40's position as follows:

1280	640	320	160	80	40	20	10
0	0	0	0	0	1	0	1
+					1		
0	0	0	0	1	0	0	1

(The units positions of the BCD number have not been shown in this first stage of the conversion process.)

The conversion of the 1 in the BCD position having a value of 200 is then completed by adding a binary 1 to the 160's position:

1280	640	320	160	80	40	20	10
0	0	0	0	1	0	0	1
+			1				
0	0	0	1	1	0	0	1

Since there are no more binary 1's in the hundreds positions of the BCD number, the conversion to tens is complete. (If there were more binary 1's in the hundreds positions, *e.g.*, a 1 in the 800's position, they would be converted in a similar manner, *e.g.*, converting the 1 in the 800's position by adding binary 1's to the 160's position and the 640's position.

The next step in the conversion process is to convert the now augmented tens positions:

1280	640	320	160	80	40	20	10
0	0	0	1	1	0	0	1

to units. The original units value 3 needs no conversion:

128	64	32	16	8	4	2	1
0	0	0	0	0	0	1	1

The augmented tens positions can be converted to units in exactly the same manner as was used for unaugmented tens

positions. First, the 1 in the augmented tens position having a value of 10 is converted by adding a binary 1 to the 2's position as follows:

128	64	32	16	8	4	2	1
0	0	0	0	0	0	1	1
+						1	
0	0	0	0	0	1	0	1

and then adding a binary 1 to the 8's position:

128	64	32	16	8	4	2	1
0	0	0	0	0	1	0	1
+				1			
0	0	0	0	1	1	0	1

The 1 in the augmented tens position having a value of 80 is converted by adding a binary 1 to the 16's position:

128	64	32	16	8	4	2	1
0	0	0	0	1	1	0	1
+			1				
0	0	0	1	1	1	0	1

and then adding a 1 to the 64's position:

128	64	32	16	8	4	2	1
0	0	0	1	1	1	0	1
+	1						
0	1	0	1	1	1	0	1

Finally, the 1 in the augmented tens position having a value of 160 is converted by adding a binary 1 to the 32's position:

128	64	32	16	8	4	2	1
0	1	0	1	1	1	0	1
+		1					
0	1	1	1	1	1	0	1

and then adding a binary 1 to the 128's position:

128	64	32	16	8	4	2	1
0	1	1	1	1	1	0	1
+ 1							
1	1	1	1	1	1	0	1

to complete the conversion.

BCD numbers with even higher valued digit positions (1000's, 10,000's, etc.) can be converted by beginning at the highest valued positions and converting them to the next highest valued positions, then converting the augmented next highest valued positions to the third highest valued positions, and so forth. The conversion is complete when all higher valued positions have thus been converted to units.

IN THE

Supreme Court of the United States

October Term, 1971

No. 71-485

ROBERT GOTTSCHALK, COMMISSIONER OF PATENTS,
Petitioner

v.

GARY R. BENSON and ARTHUR C. TABBOT,
Respondents

ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS

BRIEF AMICUS CURIAE FOR APPLIED DATA RESEARCH, INC. (ADR)

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IN THE

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October Term, 1971 — No. 71-485

ROBERT GOTTSCHALK, COMMISSIONER OF PATENTS, *Petitioner*

v.

GARY R. BENSON and ARTHUR C. TABBOT, *Respondents*

On Writ of Certiorari to the United States Court of Customs and Patent Appeals

BRIEF AMICUS CURIAE FOR APPLIED DATA RESEARCH, INC. (ADR)

Applied Data Research, Inc. (hereinafter ADR) files this brief amicus curiae in opposition to Petitioner, together with letters of consent of the parties in accordance with the Rules of the Court.

QUESTIONS PRESENTED

Whether a computer system formed by the addition of software programming to a general-purpose digital computer (hardware)[1] is a machine structurally different from that of the hardware.

Whether the process performed by the software-hardware combination is a machine process.

1. This brief is based on and adopts the definitions and technical discussion of the ADAPSO/AISC Brief, and this brief may best be considered subsequent to that ADAPSO/AISC Brief.

INTEREST OF AMICUS CURIAE

ADR was incorporated in 1959 and since then has been a small business engaged in the computer field in the marketing of various computer services and proprietary software products. ADR presently markets six software products and has been awarded two software patents, one of which was the first patent[2] issued for a software product on the market. This product AUTOFLOW is currently and prominently the most successful standardized software product on the market, and it has received the widest distribution except for those software products distributed "free" [3] by IBM.

ADR is interested in filing additional patents on its innovative developments in the computer programming field, and is concerned with the implications of this case

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2. U. S. No. 3,533,086 of Martin A. Goetz, issued October 6, 1970 for "Automatic System for Constructing and Recording Display Charts."

The other ADR patent is U. S. No. 3,380,029 of Martin A. Goetz, issued April 23, 1968 for "Sorting System." The issuance of this patent received considerable publicity as a so-called "first software patent." Actually, this patent was the first one that was *candidly* presented as implemented by software programming. Prior to that, hardware companies had obtained such patents by the stratagem (called Fabian Strategy by the Patent Office Solicitor) of presenting the invention as though implemented by hardware programming, not by software. One example of such a patent is U. S. No. 3,339,182, "Optimum Result Computer" of IBM. The use of this stratagem by the hardware manufacturers and its recognition by the Patent Office and others manifest the common understanding of the engineering equivalence of the software and hardware technologies.

3. The ADAPSO/AISC Brief documents the IBM marketing procedure for the so-called "free" software, the price of which is surreptitiously incorporated in the hardware price.

Since the IBM "free" software is supplied to all interested customers, it tends to saturate the potential market. Thus, it is difficult to compare the marketing success of ADR's software products, which are priced and face competition, with IBM's.

for the patents currently held by ADR and patents that it wishes to acquire in the future.[4]

ADR is a manufacturer of special-purpose computers based on software programming, which software is intended for use with standard general-purpose computers, or hardware, available from hardware manufacturers such as IBM. Though ADR is a small business, it can engage in such a manufacturing business, due to the nature of the technology, and successfully compete in an open market with the giant hardware manufacturers such as IBM. The latter also markets software programming, though its principal business is nominally (as a reflection of its hardware pricing strategy) the manufacture of computers based on hardware programming.

The following information reflects ADR's experience in developing and marketing its software products: The initial cost to develop a software product ranges between $50,000 and $500,000. As an average, about $200,000 per product is usually invested. The annual cost to service, maintain and enhance each product is about equal to the development costs. ADR has invested about 1 million dollars in the development and maintenance of AUTOFLOW. It usually takes 1 to 2 years to develop a product to the point where it is marketable. At least 1 year on the market is required before the number of sales for a particular product reaches a satisfactory level in terms of profitability. Software products are expected to remain marketable for at least 5 years, and must be continually improved to stay competitive during that period. Certain software products, however, may be useful for as many as 10 years or more. The obsolescence factor is more dependent upon the lifespan of the hardware on which a software product is operational than on the functioning of the software program itself. In summary, large investments must be made prior

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4. ADR has no interest in any patent that may issue on the Benson and Tabbot application.

to marketing a software product, and continuing investments are required throughout its marketable life-span.

Petitioner and the supporting hardware manufacturers and their association, BEMA, oppose patents for software implemented inventions on the grounds that software programming is merely a "mental process," as though it had a certain ephemeral character, a non-physical or non-machine character.[5] Knowing that it is not in the "mental process" business but in a machine business, as are all of its competitors, both hardware and software manufacturers, ADR seeks to illustrate for the Court some salient features of the computer business.

ADR is concerned that the BCD-to-binary converter of Benson and Tabbot is not representative of software programming, and that, by this single example, a misleading picture has been presented to the Court, and erroneous conclusions have been drawn therefrom by the amici hardware manufacturers. ADR therefore hereinafter sets forth some examples of the variegated software technology.

The C.C.P.A. findings of fact in prior cases[6] are implicit in the present case. They are: 1) that general-purpose hardware is structured by software into a special-purpose computer, and the structure of this special-purpose machine is different from that of the general-purpose machine and is determined by the inserted software, and 2) that hardware and software forms of programming are engineering equivalents. Once the facts are recognized, the patentability of the special-purpose machine follows directly from the statutory provision that machines are patentable subject matter. The briefs of Petitioner and the hardware manufacturers do not deny these findings of fact,

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5. See Jacobs, "Patentable Machines—Systems Embodiable in Hardware or Software (The Myth of the Non-Machine)," Proc. Law of Software, 1968, p. B-77, Geo. Wash. Univ. Natl. Law Center.

6. *In re Prater*, 415 F. 2d 1393 (1969); *In re Bernhart*, 417 F. 2d 1395 (1969); *In re Mahony*, 421 F. 2d 742 (1970); *In re Musgrave*, 431 F. 2d 882 (1970); *In re Foster*, 438 F. 2d 1011 (1971).

but by predicating their attack against the patentability of software programming on "mental process," the hardware manufacturers are indirectly attacking these findings and are, in effect, seeking their reversal by this Court.

SUMMARY OF ARGUMENT

The technological facts as well as the interests of all of the amici curiae on both sides of this case reveal that the real issue is that of patents for machines and machine processes in the field of computers or automatic data processing—and not patents for "mental processes" or mathematics. These facts include:

1. The facts of the opposing economic interests of competitive hardware and software companies in the computer industry;

2. The facts of the computer technology, both hardware and software, which are illustrated by a number of examples; and

3. The facts of this case concerned with a process for the conversion of BCD to binary.

The examples of hardware and software technology illustrate the engineering equivalence of software and hardware, the adequacy of the search and classification facilities for both, and the suitability of defining the invention for either technology as a machine or a machine process.

ARGUMENT

A. *Software programming is a machine device.*

1. The economics of the computer industry, as well as the opposing economic interests of the competitive companies in the computer industry, demonstrate that the real issues involved in this case are machines and machine processes, and not "mental processes."

The software side, or sub-industry, of the computer industry is itself a multi-billion dollar business for "automatic data processing." The hardware manufacturers' argument about "mental processes" and ideas seeks to perpetuate a myth of the non-machine.[7] These legal arguments stand in strong contrast to their advertised claims for superior machine construction and operation due to the software.[8] The multi-billion dollar business is predicated on software programming which directs the operation automatically of stored-program general-purpose hardware to produce "extended machines." Without soft-

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7. See Jacobs, *supra* note 5.

8. See a current Burroughs advertisement in 227 Scientific American 2, July 1972, in which Burroughs sells its machines (hardware and software) with the claims of "More powerful and productive computer systems" that offer, inter alia, "A comprehensive library of program products for major savings in program development time and related costs" and of "A more powerful and productive master control program" that "increases throughput 10 to 20% . . . [and] confirms Burroughs leadership in control program technology." See also the news article, "Burroughs' Wide Ride With Computers," Business Week, July 1, 1972, pp. 54-58.

A current IBM announcement (in the Wall Street Journal, August 3, 1972, pp. 43, 49) of its new machine technology also stresses the machine character of the software in offering its product for sale: "System 370 virtual storage is created by circuitry and advanced programming that link slower but far less costly peripheral disk storage to main storage in the computer." Certainly, it is not a "mental process" that, together with circuitry, does the *linking* of the disk storage to the main storage.

ware programming, there would be no use for the general-purpose hardware,[9] but with software, the computer industry has developed.

Although it is almost impossible for a small software company to compete successfully against IBM's "free" software products, ADR has done so with its AUTOFLOW product for which it has a patent. ADR's software product AUTOFLOW is directed to an automatic system for developing flowcharts of software programming without human intervention. The system that ADR competed with when it placed AUTOFLOW on the market in 1965 was one offered "free" by IBM to its customers. The IBM FLOWCHART[10] system for the IBM/360 hardware was not a fully automatic system, since the programmer was himself compelled to sketch manually a rough draft flow diagram of the software programming that he wished to chart. With records of this rough draft, the IBM FLOWCHART software was used to control the hardware to operate in the nature of a drafting machine to draw a finished flowchart. Unlike the IBM "free" software, ADR's AUTOFLOW is fully automatic, so that the layout of the flowcharting is "planned" automatically, and thereafter the flowchart is automatically completed.

In marketing its AUTOFLOW product, ADR found the potential IBM/360 market totally saturated with IBM's flowcharting program. ADR initially experienced considerable resistance on the part of IBM computer users against paying for a flowcharting program when they got one "free" from IBM. ADR was compelled to invest heavily in educating the market as to the difference between the semi-manual system of IBM and the fully automatic system of ADR, even though IBM's semi-manual flowcharting was

9. This point has been made in the industry with some slight overstatement by the suggestion to one who sought some criteria for evaluating such general-purpose hardware sans software to call in a junkman, who would ask simply, "What does it weigh?"

10. See IBM Technical Newsletter, System/360 FLOWCHART, No. N 20-0069-0 Sept. 12, 1966.

not competitive, neither technically nor in the final flowchart that was achieved. ADR was ultimately successful in the marketing of its product, in one of the first and few instances of such successful competition with IBM's "free' software.

Without reasonable prospects of obtaining a patent, ADR would have been confronted with the situation that IBM could use the concepts of the AUTOFLOW system (for which a patent was finally granted) and develop a system similar to AUTOFLOW and give it away "free." Were that to have happened, ADR's AUTOFLOW business would have been destroyed. ADR has sold or leased more than 1500 units of its AUTOFLOW software product, with gross sales of about 10 million dollars.

The hardware manufacturers such as the amici curiae supporting Petitioner have obtained patents for their hardware programming developments; these are the products they price in the bundle of hardware and software that they sell. However, the hardware manufacturers do not wish to be restrained in any way by software patents that companies such as ADR may obtain; for such patents would enable small software companies, as in the case of AUTOFLOW, to enter into competition with the hardware manufacturers even as against the "free' software.

Thus, the software business, in every respect, is concerned with the sale and use of automatic machines and not with "mental processes."

2. The facts of the technology and the findings of fact of the C.C.P.A. in this case and in its predecessor cases are that a programmed digital computer is a special-purpose computer or machine, and the process it performs is a machine process, not a "mental process."

These C.C.P.A. findings of fact[11] that software is a machine device which structures the general-purpose hardware are not denied by Petitioner nor by the hardware

11. See *Prater* and *Bernhart*, *supra* note 6.

manufacturers. Instead, arguments are made that since the process can be understood mentally, and in principle performed mentally, therefore it must be a "mental process." Such argument flies in the face of the entire purpose of the computer program technology, which serves solely to provide machine processes and machine devices and is not concerned with mental processes in any way, certainly not in a business way.

The processing of data by a human being, the "mental process," (which, when performed by pencil and paper, is a manual process) in some cases bears at most superficial resemblance to the machine process of automatic data processing, just as manual sewing with needle and thread only superficially resembles sewing with a sewing machine. That the "workstuff"[12] of automatic data processing is "data," the same as manual data processing, does not make the automatic process a manual process nor a "mental process."

The following examples of a variety of automated machine systems implemented by software (those of ADR's two software patents and two others) are illustrative of machine processes that are quite different from the human "mental process."

(a) *AUTOFLOW Flowcharting System.* One unique feature of the software technology is the capability of making "decisions," which has led to the mistaken impression that computers "think." This "decision" feature reveals that a computer program is *not* (except in a trivial sense) merely a sequence of hardware operations (or "instructions"). In practice, a program is made up of many interrelated sequences of operations. It is not like the player piano that invariably plays the same sequence of chords directed by the holes in the piano roll. The "decision"[13]

12. *In re Benson and Tabbot*, 441 F. 2d 682, 687.

13. The term "decision" is a rather pretentious one to describe a machine control operation or "selection" which controls processing to follow one of a number of alternative paths of operation. The criteria for selection are the intermediate results of data processing.

capability enables the program to jump from one sequence to another and back again, depending on the results of the processing of the data at different stages. Thus the sequences of operations vary with the nature of the data being processed.[14]

The alternative paths of data processing resemble a maze with an almost infinite number of alternative choices. For example, if there are 50 specific decision points, the number of possible paths is 2^{50} or over one trillion choices (and more than 50 decision points are common within programs). The control of data as it passes through the logical maze is not a function of the hardware, as is commonly believed (the hardware performs each of its command operations in the same way for any program), but rather a function of the particular software that directs the hardware. The variable sequence of operations uniquely defines a special-purpose computer.

These multi-directional mazes of alternative paths of processing flow of nearly any large or small program are charted automatically by the AUTOFLOW system (see the Appendix)[15] which cannot "think" and which therefore does not know if it is flow-charting a sorter program, a program for analyzing printed characters (e.g. to read and sort mail in a post office), a program for synthesizing voice (so that the blind can receive communications from a com-

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The technical jargon in the computer field, which is often quite anthropomorphic in suggesting human characteristics where none exists draws upon the only available terminology that we have, and uses existing words with special machine meanings. The hardware manufacturers' arguments about "mental processes" are largely and speciously based on this anthropomorphic terminology.

14. See Jacobs, supra note 5, for a discussion of an equivalent hardware technique corresponding to the software "decisions" for producing alternative paths of processing.

15. In the Appendix, a photograph of a small segment of a flowchart is shown being produced by a computer printer under control of AUTOFLOW. The diamond-shaped blocks in the flowchart are the "decision" points whence flow two or more alternative paths of processing.

puter), or any of a large variety of other programs that a computer center may have (for directing its single set of hardware). The data processing paths of AUTOFLOW are themselves configured in a complex multi-directional maze.

The AUTOFLOW patent,[16] therefore, is directed to a process which in no sense duplicates a mental or manual process. The Government, one of the most enthusiastic customers of AUTOFLOW, has encouraged its use because it is *not* like a manual or mental process: ". . . manually drawn flowcharts often reflect what the programmer intended to have the program do rather than what he coded it to do. By the use of AUTOFLOW, computerized flowcharts are produced which precisely describe what the programmer has coded."[17] Thus, AUTOFLOW employs a *unique* process which is designed to employ the operational characteristics and equipment of the general-purpose computer hardware with which it operates, but to overcome the hardware's limitations and achieve the desired flowcharting in a useful form by practical means. This process is clearly not a mathematical[18] nor a "mental" process.

(b) *ADR's Sorter Patent.* A second ADR patent[19] is concerned with the most common (at least in the commercial field) form of automatic data processing, that of sorting data (e.g. placing machine records in numerical or alphabetical sequence). In the sorting system of ADR's patent, strings of records are recorded on magnetic tapes which can be "read" or "played back" only when moving in the forward direction.

The sorting is performed on strings of records on successive tapes, followed by merging the sorted strings of records of those tapes and storing the merged records

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16. See *supra* note 2.

17. Goddard News, Public Information Office of the Goddard Space Flight Center, NASA, Dec. 12, 1966, pp. 3, 7.

18. At ADR, in the development of software products, the special mathematical skills of mathematicians are not used.

19. See *supra* note 2.

on a tape. The next set of records is similarly sorted and merged, and so on until the tapes all have merged strings of records, whereupon they are merged and stored on one tape. This alternating between sorting and merging is repeated until all of the records are sorted. The patent shows that this sort-merge operation is a very efficient one where the magnetic tapes can be read while moving in one direction only, and the rewinding of tapes occurs during time periods when its records are not needed for sorting or merging.

The subject matter of the patent is a sorting machine (which preferably is embodied in software) and the process of that machine. Data sorted by a "mental process" would, by no stretch of the imagination, ever be subjected to the data process described in the ADR sorter patent. The entire purpose of the patented system is to perform operations at high speed, at millionths and thousandths of a second, and to manipulate the tapes in a certain way to overcome their limitations of being read in one direction only. The process is clearly neither mathematical nor "mental."

(c) *Recognition of Printed Characters.* Many machine systems have been developed and new ones continue to be developed for automatic reading of printed documents. The machines for this purpose consist of: 1) an input device (e.g. an optical sensor) for detecting electrical signals corresponding to the patterns of black and white print that form a printed symbol, 2) an analyzer for processing the patterns of any signals to identify the symbol, and 3) an output device (e.g. a printer or a control device).

A machine process for analyzing signals to identify numerals or the letters of the alphabet is not the human mental process for reaching the same result, nor is it a mathematical process. The character recognition analyzer may take a wide variety of forms, independent of the types of input and output devices, and it may be embodied either in software or hardware or some combination of software and hardware, depending on various engineering consid-

erations. Generally, hardware is faster, but it suffers from the disadvantages of requiring a larger investment to tool up for mass production, and it may be too expensive for more complex systems.

The software approach for the character recognition analyzer is more flexible and permits a company to build a machine and to test it out before finalizing the hardware design. In addition, the company can place the machine on the market in the software form for commercial use, and be able readily to modify, enhance and debug it as field use develops. As this technology developed, the machine analysis (for example, for hand print) became more complex and, at least initially, was implemented by software.

In any of these cases, the hardware and software forms of a character recognition analyzer may be essentially the same in all material aspects, since the hardware and software forms are engineering equivalents. The machine and its process would be generally the same whichever form of programming, hardware or software, were used. From the standpoint of patent protection, it should make no difference which engineering form is chosen by a company. Hardware manufacturers such as IBM have for many years obtained patents for their character recognition analyzers, which they market in hardware form. Under the C.C.P.A. decisions, a small company should be able to obtain a patent for an innovative character recognition analyzer which initially is embodied in software form, and which subsequently, by the small company or by a hardware manufacturer, may be embodied in hardware form.

The "mental process" of recognition is, of course, distinctly different from the machine process of character recognition equipment. Any patent obtained on such equipment or its process, we know, would not cover a "mental process" nor mathematics.

(d) *Voice Assembly.* Digital computer techniques have been developed for assembling speech from pre-

recorded syllables in which parts of words are stored in a computer memory, and a special-purpose computer is used to assemble complete words and transmit them to a human operator (e.g. in a bank, in response to an inquiry about a depositor's bank balance, or a blind man's request for data from a computer data bank). Such a special-purpose computer may be implemented by software programming for a general-purpose computer, or by hardware programming, or by an appropriate combination of the two. The particular form of embodiment, hardware or software, would not affect the machine character of the system and the machine process that it would perform. In neither case would the patent cover mathematics or a "mental process" (that is, a human process for the assembly of speech).

Summary. In each of these examples of machines (an automatic flowcharter, a sorter, character recognition equipment, voice assembly equipment) the hardware may be the same (e.g. the hardware of any of the hardware manufacturers). The hardware is uniquely structured by the software of these widely different machines as required, without rewiring the hardware and without otherwise changing the hardware or its basic operations. In each of these cases, it is clear, not only is there a machine process distinctly different from a human "mental process," but any patents on these systems would not cover mathematics or prevent the human performance of any "mental process." This is especially clear in the ADR AUTOFLOW and Sorter patents, where the inventions are defined in the claims as machines, rather than machine processes.[20]

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20. In accord with the engineering equivalence of software and hardware, is the C.C.P.A. holding in the *Prater* and *Bernhart* cases, supra note 6, that it is appropriate to define the invention as a machine in patent claims using the statutory claim form specified in 35 USC 112. The 1966 Patent Office Guidelines to the Examination of Computer Programs, 829 O.G. 1, 2, Aug. 2, 1966, also acknowledge the suitability of defining software as a machine de-

3. The facts of this case deal only with machines and machine processes, not with "mental processes."

The BCD-to-binary converter of this case has utility solely in a digital computer device. This method of conversion has no practical use outside of such a computer, and neither the Petitioner nor the supporting hardware manufacturers have suggested any. The performance of this conversion manually or "mentally" by a human as suggested in the briefs of Petitioner and the hardware manufacturers is merely for explanation to the Court of the conversion process.

The BCD code is used solely for digital equipment; for example, for human-operated input devices such as a keyboard or human-read output devices such as a printer, which serve as an interface between a digital computer system and a human operator. Humans generally work with decimal numbers, while the computer operates in binary numbers. Therefore, a conversion from one to the other is required. This conversion is always performed in and automatically by a machine, whether by software or hardware programming.

Any patent to issue on this invention would cover a machine process only. Had the subject matter of this case come before the Court as an infringement suit against IBM or one of the other hardware manufacturers as defendant, which made, used and sold a Benson and Tabbot converter, the defensive cry to the patentability of that converter on the grounds of "mental process' would be a strange one

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Note —Continued

vice in this fashion. This procedure was followed by ADR in its patents for AUTOFLOW and the Sorting System.

The question of defining software-embodied inventions as machines did not arise before the C.C.P.A. in this case, and the only claims now before the Court are process claims. The machine form of claims would, of course, not be infringed by a "mental process," and is, therefore, not in issue.

when the infringement[21] took the singular form of a machine process.

B. *The search and classification facilities for inventions embodied in software are substantially the same as for those embodied in hardware, and they are adequate.*

An understanding of the search facilities for software implemented technology may be appreciated from experience with the examples discussed above. In the ADR AUTOFLOW patent, seven articles from technical and computer science journals[22] bearing on automatic flowcharting using software were cited and made of record. Thus it is seen that for many years technical journals and proceedings of technical conferences in the industry have provided a valuable source of technical literature of this

21. Software users would face no unusual business risks as a consequence of software patents. If the software were supplied by the hardware manufacturer, those manufacturers would be responsible for the infringement just as they are for the hardware that they market.

ADR's AUTOFLOW patent was obtained to protect the company's enterprise and enable its entry into the marketplace. Other companies besides IBM market flowcharting software products that are not covered by the AUTOFLOW patent. They would know of that patent if they considered imitating AUTOFLOW. It is unlikely that any computer user would build his own flowcharting system or use in-house when he could buy it at moderate cost from ADR. For practical reasons, such individual infringers would not be prevented from doing so by ADR, which would only be concerned with a substantial infringement.

22. Three of the articles came from "Communications of the Association for Computing Machinery," 1959, 1963 and 1965, respectively, two others of the articles came from "Proceedings of Fourth Annual Meeting of UAIDE" (a 1965 software conference), another article came from the "Proceedings of the Western Joint Computer Conference" (1959), and the seventh came from "The Proceedings of the Association for Computing Machinery Conference," 1965.

developing technology of software. Such journals also provide a source of bibliographies, abstracts, reviews and classification indices of the technology, as would be expected, for those who work in this advanced technology.[23] These examples expose the falsity of any suggestion that there is a dearth of technical literature in this field.

In the ADR patent for the "Sorting System," seven patents were made of record by the Patent Office, as well as an article from the "Conference Proceedings" of the American Federation of Information Processing Societies, 1964. The seven patents are directed to hardware forms of sorting. The patent search files on sorting machines are very well developed in the Patent Office, and the technical literature on software versions of sorting systems is also very much available.

As noted above, sorting may be done by hardware or by software, or by some combination of the two, and sorting systems initially developed for software implementation may subsequently be implemented in hardware form. Therefore, the Patent Office, in order to examine patent applications involving hardware-implemented sorting inventions, requires technical facilities for the software technology as well as that of the hardware.

The Patent Office has extensive collections of patents and articles from technical journals dealing with machine systems for the recognition of printed characters. The implementation of such systems, and particularly the analysis portion thereof, by software or hardware would generally be in the same classification and require similar searches. Voice assembly systems implemented in hardware have been patented for many years, and in more

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23. See, for example, *Computing Reviews* of the Association of Computing Machinery for technical reviews and abstracts and classified indices and bibliographies thereof; *Computer and Information Systems* for "abstracts of the literature of information processing" classified by subject matter; *Transactions on Computers* of the Institute of Electrical and Electronic Engineers for "abstracts of current computer literature" classified by subject matter.

recent years the use of both software and hardware for implementing such systems has resulted in the filing of patent applications for both types. Their examination would be quite similar whether implemented in software or in hardware.

Thus, adequate search and classification facilities are available for machines implemented either in software or hardware, and common facilities are needed for both in view of their engineering equivalence.[24]

CONCLUSION

The findings of fact and conclusions of law of the Court below are soundly based, and its decision should be affirmed.

Respectfully submitted,

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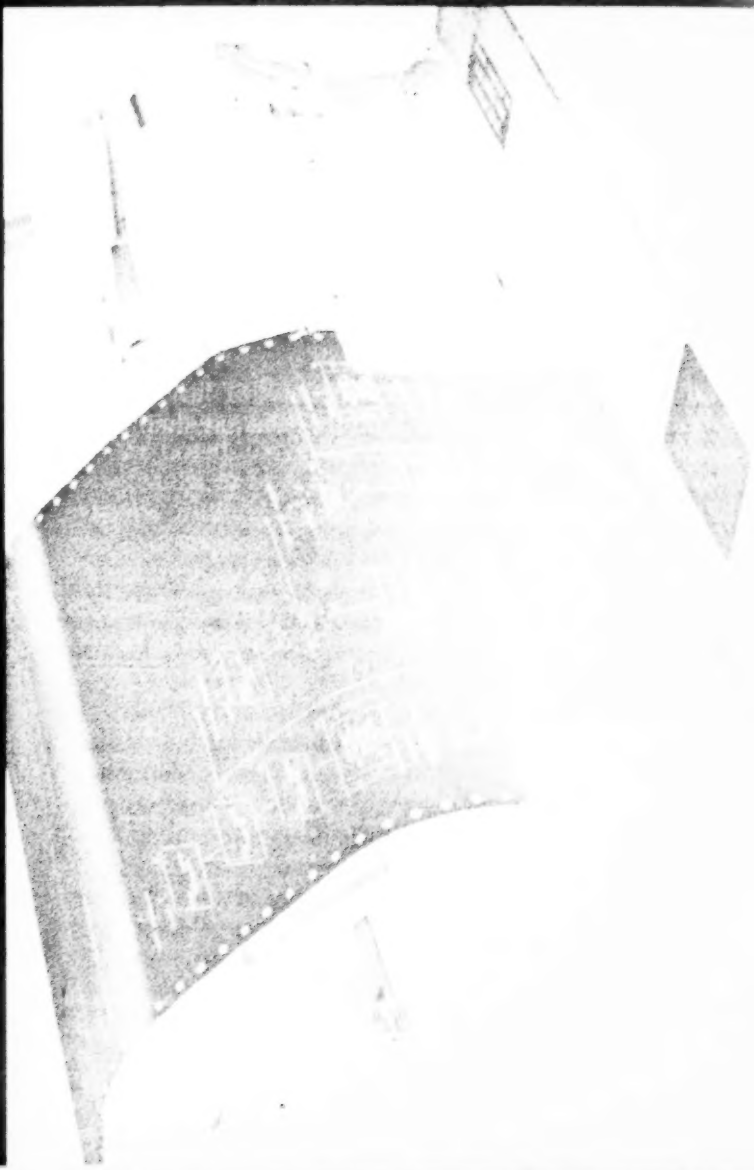
24. As recognized by IBM, ". . . in some respects computer programs and hardware are interchangeable; hence one can say that a new computer program is similar to a new machine." Galbi, "Proposal for New Legislation to Protect Computer Programming," 17 Bull., Copyright Soc'y 280, 281.

APPENDIX

AUTOMATIC FLOWCHARTING WITH PATENTED ADR AUTOFLOW SYSTEM



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Appendix 1a

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the Supreme Court of the United States

OCTOBER TERM, 1972

No. 71-485

OBERT GOTTSCHALK, COMMISSIONER OF PATENTS,
PETITIONER

v.

GARY R. BENSON AND ARTHUR C. TABBOTT

RIT OF CERTIORARI TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS

REPLY BRIEF FOR THE PETITIONER

Although respondents insist that the invention h they claim here is a "machine process," see , pp. 3–5, they refer in their brief more than two times to the "PBX" telephone system which have developed and to which they allege that this t application relates. The pervasive suggestion ghout their brief is that the mathematical em for converting binary-coded-decimal numbers pure binary numbers for which they now claim a t monopoly is limited to use in their PBX ratus. At times, respondents appear almost to

78-484—72——1

suggest that the patent they seek here is similar to a patent on the PBX machinery itself.

Examination of the claims which respondents made in the Patent Office, and which are now before this Court, however, shows that the monopoly which they seek is in no way limited by reference to the PBX device, and, in fact, can only be interpreted through extrapolation to contain an apparatus limitation embracing the very broad category of digital computers or other data processing devices.[1] Respondents suggest that the lack of express limitation in their claims can be made up for by study of the potential application of their invention in the light of "technological realities." In so arguing, they rely on the doctrine that the specification[2] may be used in construing the claims of an already-issued patent. (Resp. Br. 17–18 and n. 14). In considering an application for a patent, however, the Patent Office is entitled to rely on the doctrine that the applicant's claim is the measure of the grant (see Pet. Br. 29). In order to protect the public from any attempt by respondents in the future to expand their claim, the Patent Office is authorized, and indeed, required, to recognize only the express

[1] Respondents now claim that the data processor must be an "electrical", rather than a "hydraulic" or other "non-electrical" device (Resp. Br. 17, 25). This newly-asserted limitation is unsupported by any language in their claims (see Pet. App. 38–39, 40–41), and is, in any event, trivial (see Pet. Br. 25–26).

[2] The specification is the illustrative and descriptive section of the patent application which demonstrates the utility of the claimed invention. See 35 U.S.C. 112.

limitations claimed in the patent itself.[3] Under this standard, the claims at issue here and the patent monopoly at stake are on a general method of BCD-binary conversion, for any purpose, limited at most to use in a digital computer; they are in no conceivable way limited to a PBX telephone system or the method of operating it.

2. Respondents attempt to distinguish their claimed algorithm from a mathematical theorem by applying to it the label "machine process". The label does not change the fact that, as shown in the Appendix (*infra*, pp. 13–18), respondents' mathematical discovery and new technique for converting BCD numerals into pure binary numerals by the strategic placement and addition of 1's is no more than multiplication in binary by the decimal number ten (binary 1010). And their algorithm, discussed at length in their brief, is no more than a translation into computer programming of a set of multiplications by binary 1010.[4] Whether called a "machine process" or any other name, their procedure no more varies from their mathematical theorem than the translation "deux et trois" differs from "2+3."

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[3] *Siegel* v. *Watson*, 267 F. 2d 621, 623 (C.A.D.C.); *Application of Kebrich*, 201 F. 2d 951, 954 (C.C.P.A.); *Application of Prater*, 415 F. 2d 1393, 1404–1405 (C.C.P.A.); *Barry* v. *Brenner*, 256 F. Supp. 96, 98 (D.D.C.).

[4] Indeed, respondents' algorithm is barely more than a translation of the definition of a BCD numeral from the language of mathematics to that of computer programming, analagous to a translation of "2+3=5" into "deux et trois font cinq" or "0010+0011=0101".

If the mathematical theorem itself is unpatentable, and respondents now appear to concede that (Resp. Br. 24), then translating it into a computer algorithm or program no more imports patentability than it does to convert the equation "$A=\pi r^2$" into a computer algorithm for determining the area of a circle. The algorithm is as abstract as the equation, and even if they are the products of inventive genius, which is immaterial here, neither has the tangibility necessary for a monopoly grant under our patent system.

Respondents imply throughout their brief that their claimed "machine process" is more than a mere algorithm or theorem because the mathematical process that it embodies is likely to be carried out in a machine, *i.e.*, a digital computer or other data processing device. But if a translation of an unpatentable mathematical principle could itself become patentable, it could only do so by reason of a further inventive ingredient, such as a novel and unobvious device for carrying out the translated principle, or if a conventional device were used then a new and unconventional synergism or cooperation between the conventional device and the translation of the mathematical principle. Here there is no new device used to carry out the algorithm which translates respondent's theorem into computer language; the program is carried out on a conventional computer or data processor. Nor does the algorithm or program synergize with the computer in any unconventional way; they co-act with one another the same way any program and computer co-act. (Cf.

Anderson's-Black Rock, Inc. v. *Pavement Salvage Co., Inc.*, 396 U.S. 57; see Pet. Br. 26–27.)

Respondents' allegation that their theorem and its translation into an algorithm give the general purpose computer "a function that it would not otherwise possess" (Resp. Br. 40, n. 35) amounts to a play on words, for the function of a general purpose digital computer is to solve problems "by actually doing arithmetic" in the manner specified in a program embodying an algorithm.[5] The computer does not acquire a new function, in any sense recognizable by the patent law, every time it is programmed to perform a different set of arithmetical calculations, any more than a player piano acquires a new function each time it plays a new song. The algorithm therefore has no inventive status beyond that of the mathematical theorem that it embodies and translates. Since the latter is concededly unpatentable, so too is the former. See, *e.g.*, *Armour Pharmaceutical Company* v. *Richardson-Merrell, Inc.*, 396 F. 2d 70 (C.A. 3).[6]

3. In support of their argument that the absence of apparatus and end use limitations is not fatal to their

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[5] Benray, *Understanding Digital Computers* (1964), p. 4.

[6] Respondents misunderstand the government's references to synergism and obviousness. We do not contend here that the patent should not be granted because respondents' mathematical theorem is obvious. We contend that the patent should not be granted because (1) what it claims amounts to a direct translation of their theorem into another language (that of computer programming) and (2) there is no additional claim of an unobvious implementing device nor any synergism between a device and the algorithm that raises the claimed algorithm above the unpatentable status of a theorem.

the things to be done to them removed the claimed processes from the realm of abstract ideas to the tangible realm with which our patent system is exclusively concerned (see Resp. Br. 23–24 and n. 19; Pet. Br. 17–21).[7]

On the other hand, the manipulation and transformation of intangible entities—such as electrical energy for telecommunication (as in *The Telephone Cases*, 126 U.S. 1, and *O'Reilly* v. *Morse*, 15 How. 62), or information or data processing (as here)—necessarily does *not* involve physical substances on which physical acts are performed; as a consequence, in claims for methods in this area the lack of machinery or apparatus limitations which was acceptable in *Corning*, *Cochrane* and other cases cited by respondents becomes fatal to patentability, for without these limitations the scope of the claimed monopoly cannot be determined by the Patent Office or subsequent competitors, and the grant embraces any tangible application of the idea that others may subsequently invent. For this reason the Court in the *Morse* case struck down Morse's eighth claim (Pet. Br. 22 and n. 22), for the method of printing characters at a distance by use of electricity. At the same time, however, the Court upheld Morse's first claim, which was a method claim almost identical to his eighth claim except for an apparatus limitation on the process. The important difference in claim 1 was that the teleg-

[7] Furthermore, such processes usually contain inherent end use limitations which confine the monopoly over application of the claimed methods to a specified field of technology. See *infra*, pp. 10–11.

raphy process was to be monopolized only "when developed by the action of such [electrical] current or currents, *substantially as set forth in the foregoing description of the first principal part of my invention,*" 15 How. at 85, 112 (emphasis supplied).[8] Though the *Morse* case and *The Telephone Cases* do not state the rule, in so many words, that patents on processes which do not involve the manipulation and transformation of physical materials from one physical or chemical state into another, must contain limitations confining the monopoly grant to the practice of the method by means of particular types of apparatus, we submit that the cases follow such a rule—implicitly or explicitly—and that they cannot be rationalized otherwise.[9]

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[8] The language "substantially as set forth" was deemed to limit the claim to the described machinery. Cf. *Seymour* v. *Osborne*, 11 Wall. 516, 547.

[9] The respondents' discussion of *The Telephone Cases* (Resp. Br. 25, 28) ignores the fact that Bell claimed his method of telephony only as practiced with the magneto or variable resistance apparatus. The Court said that perhaps no other useful apparatus would in fact be invented by others, so that as a practical matter Bell's method of using magneto or resistance apparatus might actually command a total monopoly over all telephony. But as the Court properly observed, that did not make Bell's claim one for all telephonic use of electricity—Bell had claimed no more than he discovered, which was the method of practicing telephony by means of the magneto or resistance apparatus that he had conceived.

Respondents, in our view, simply misstate *The Telephone Cases* when they assert (Resp. Br. 28, n. 24) that a method claim was upheld there which was not confined to any particular apparatus. The infringers used the variable resistance method (see 126 U.S. at 314), and they attempted to have the Court confine the patent to the magneto apparatus and the

We also contend, as in our main brief, that the cases show that a process patent, such as respondents seek here, must be confined to a specified field of technology, such as telegraphy, telephony, or the operation of railroad trains (Pet. Br. 21–24). Without such limitations the scope of the governmental grant of monopoly is both unforseeable and beyond the applicant's inventive contribution, to the injury and prejudice of the public. The degree of definiteness required in an end use limitation is, of course, difficult to define precisely. Respondents assert, without support, that our position here logically requires that we insist on end-use limits as narrow as the use of a telephone system for withdrawing cash from banks (rather than telephony alone or cash-withdrawal systems alone) (Resp. Br. 28). Their argument proves no more than we have already conceded—that the question is a matter of degree, and that the precise point at which the line is to be drawn is unclear (Pet. Br. 22). But that is a familiar problem in many areas of law (see, *e.g.*, *United States* v. *National Dairy Co.*, 372 U.S. 29). In any event, wherever the line may be, respondents' claims are not limited to any field of technology at all. Data processing is not an adequate end-use limit; indeed, it is so all-inclusive

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process of using it (*id.* at 537). The Court held that the process claim covered the telephonic use of both the magneto apparatus and the variable resistance apparatus, although Bell had perfected and indicated a preference for only the magneto method (*id.* at 538). It therefore ruled that it would not confine Bell's monopoly merely to the magneto means he had "improvised to prove the reality of his conception," but would protect him against infringers whose telephony method used the variable resistance apparatus, as well (*id.* at 539).

as to embrace any application of a program whatsoever and therefore furnishes no limitation at all. Similarly, the end-use limit of BCD-binary conversion [10] has no more significance as applied to a program for BCD-binary conversion than would an end-use limitation on a patent for the Pythagorean Theorem confining the monopoly to applications involving the calculation of a hypotenuse. It may be that an end use reference to "PBX" telephone systems would have presented the Patent Office with a different case, but respondents have declined to accept such a limitation on the monopoly they demand. Indeed, respondents have neither proposed nor indicated any willingness to place any non-trivial use limitations on their claims.

Respectfully submitted.

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OCTOBER 1972.

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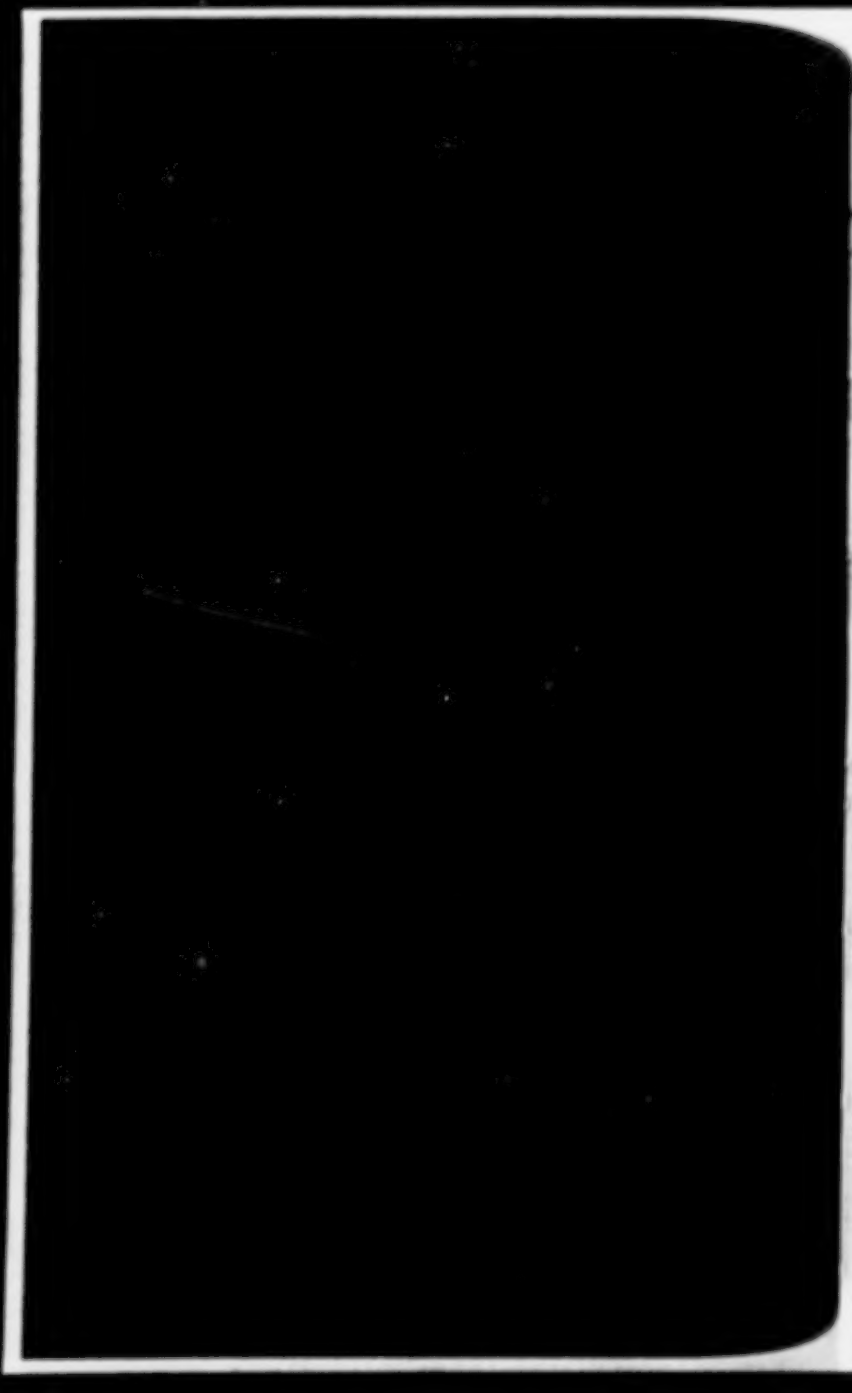
[10] Respondents' assertion (Resp. Br. 6, n. 7) that the "Patent Office has an entire sub-class—sub-class 155 of class 235—reserved for patents covering means of converting numbers in one type of system such as BCD to numbers in another type of system such as binary" and that approximately 75 patents have been issued "for means of converting between BCD signals and binary signals" is misleading. The "means" for which sub-class 155 of class 235 is reserved are machines and not processes. As we have indicated, the distinction between machinery and processes is critical to resolution of this case.



APPENDIX

ANALYSIS OF RESPONDENTS' THEOREM

In describing their mathematical discovery in the appendix to their brief, respondents recapitulate the example, which they developed in the record before the Patent Office, of converting the BCD equivalent of the decimal numeral *53* into a pure binary equivalent; in addition, they use the new example of a similar conversion of *253*. Respondents' analysis, however, as we show below, is merely a recitation and development of the mathematical identities that $53=(5\times10)+3$ and $253=(2\times100)+(5\times10)+3$. The "strategic" placement and addition of *1*'s which respondents claim as their inventive contribution is no more than multiplication in binary by the decimal number ten (*binary 1010*), with the *zeros* treated as blank spaces. Finally, we show that the claimed algorithm is merely a translation of the foregoing principles from the language of mathematics into that of computers.

1. The numeral *253* in decimal positional notation may be rewritten in expanded form as $(2\times100)+(5\times10)+3$. This is also $(2\times10\times10)+(5\times10)+3$. This expression may be further rewritten, by factoring out *10* from the first two terms, as $\{[(2\times10)+5]\times10\}+3$. The translation of the last expression into English is that the number *253* may be thought of as the sum derived by following these steps:

(1) Multiply the digit in the hundreds place (*i.e., 2*) by ten.

(2) Add to this figure the tens digit (*i.e., 5*).
(3) Now multiply the sum, as before, by ten.
(4) Add to this figure the units digit (*i.e., 3*).

2. When the foregoing steps are rewritten in BCD and binary notation, they form the basis for respondents' algorithm. First, the multiplication by decimal ten becomes multiplication by binary *1010*. Second, the multiplications and additions must be performed according to the rules of the binary system. In binary, $1\times1=1$, and any other product is zero ($1\times0=0$, $0\times1=0$, $0\times0=0$). Hence for any number multiplied with *1010*, there is a *1010* corresponding to each digit of that number which is a *1* and nothing (*0*) corresponding to each digit of that number which is a *0*. This is the basis of respondents' alleged discovery of a pair of *1*'s shifted one and three spaces, respectively, from each place where there is a *1* in the *BCD* number. That is:

$$\begin{array}{rr} 0001 & 0010 \\ \times 1010, & \times 1010, \text{ etc.} \\ \hline 1010 & 10100 \end{array}$$

The only difference from this in respondents' notation is that they replace the *0*'s with blank spaces.[1]

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[1] The examples of respondents' technique of adding binary *1*'s "in a particular sequence at designated positions" (Resp. Br. 14a–15a) is readily seen to be a multiplication by binary *1010* according to the rules of binary addition and multiplication. Their first addition step on p. 15a is to add in the italicized *1* of *1010*; their second step is to add in the other *1*. In the third and fourth additions on that page respondents deal with a *1* in the third-from-right-place of the BCD tens digit, rather than one in the right-most place. Accordingly all operations are performed two places to the left of the prior step. (The same thing occurs in ordinary multiplication in the decimal system, where the product for the tens digit of the multiplicand is

The full procedure for converting decimal *253* from BCD form (0010/0101/0011) to pure binary form is therefore as follows: Multiply each portion (going from right to left) of the four-element BCD hundreds digit (*i.e.*, 0010) by 1010,[8] and add the results to the four-element BCD tens digit (*i.e.*, 0101).[9] Multiply each portion (going from right to left) of the results of the prior step by 1010,[10] and add the results to the four element BCD units digit (*i.e.*, 0011). The resulting sum (11111101) is the pure binary numeral which is equivalent to decimal *253* and to BCD 0010/0101/0011. (Compare Resp. Br. 17a–20a.)[11]

3. Respondents illustrate the use in a shift register of the claimed algorithm (Claim 8)—applying it to the conversion of decimal *53* from its BCD form to its pure binary equivalent (Resp. Br. 8a–13a). Comparison of this use of the algorithm with the preceding mathematical derivation shows that the patent claim is merely a translation of the mathematical steps set forth in section 2, from the language of mathematics to the parallel language of computers.

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written down one place to the left of that for the units digit, and the product for the hundreds digit is written down another place to the left.) Since *1010* shifted left two places is the same as *101000*, that is the figure added in here where the *1* occurs in the BCD numeral.

[8] The results are 10100.

[9] The sum is 11001.

[10] The results are 11111010.

[11] Similarly, the full procedure for converting decimal *53* from BCD (0101/0011) to pure binary would therefore be: Multiply each portion (going from right to left) of the four-element BCD tens digit (*i.e.*, 0101) by 1010, and add the results to the four-element BCD units digit (*i.e.*, 0011). The resulting sum (110101) is the pure binary numeral equivalent to decimal *53* and BCD 0101/0011. (Compare Resp. Br. 15a–17a.)

First, the shift register is the standard device for multiplying in digital computers.[6] Each shift to left is equivalent to multiplication by two, *i.e.*, binary *10* (see Pet. Br. 24, n. 25).[7] Three shifts to the left is multiplication by eight (*i.e.*, binary 1000), and taking the sum of one shift and three shifts to the left is adding eight times the shifted number to two times the shifted number, to get a result of ten times the original number (and in binary, 1000+10=1010, so that there is a multiplication by 1010). In this context, we turn to the specific provisions of the claimed algorithm, step by step:

Step 1 of Claim 8—"storing the binary coded-decimal signal in a reentrant shift register"—is nothing more than writing down the BCD number, in preparation for conversion from BCD into binary in accordance with the derivation and algorithm.

Step 2—"shifting the signals to the right by at least three places[8]; until there is a binary '1' in the second position of said register"—constitutes locating the first position that contains a *1* (going from right to left) among the four elements of the BCD tens

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[6] "In binary computers, multiplication is accomplished by a process of shifting and adding." Standard Dictionary of Computers and Information Processing (Weik ed., 1969) (definition of "multiplication").

[7] "A digital product may be formed by additions of the multiplicand [quantity to be multiplied], in accordance with the value of the digits in the multiplier [quantity by which multiplicand is multiplied]. In the case of binary digital multiplication, it is necessary only to shift the multiplicand and add it to the product if the multiplier digit is a one, and just shift the multiplicand without adding, if the multiplier digit is a zero, for each successive digit of the multiplier." *Id.* (definition of "mutliplier, digital").

[8] In applying this step to the conversion of decimal *53* from its BCD form (0101/0011), the first element (going from right

digit,[9] so that it can be multiplied with 1010 in accordance with the algorithm.[10]

Step 3—"masking out said binary '1' in the second position of said register"—is merely erasing the signal in this position, preparatory to writing another symbol in its place during the next stage of the algorithm.[11]

Steps 4, 5, and 6—"adding a binary *1* to the first position of said register"; "shifting the signals to the left by two positions"; and "adding a binary *1* to said first position"—constitute multiplying by 1010 the first of the four elements going from right to left of the BCD tens digit that contains a *1* and adding the

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to left) of the BCD tens digit that contains a *1* (the italicized *1* of 0101/0011) is also the first element of the BCD tens digit. Therefore, the shift in step 2 is exactly three places to the right.

[9] Three shifts of the BCD tens digit to the right moves the right-most element of that digit into the second-from-right ("second") position of the shift register.

[10] The reason for locating the first *1* is that only a *1* need be multiplied, since any *0* when multiplied with 1010 (or anything else) will yield only a *0*.

[11] The conversion procedure erases the BCD form of the number and, at the end of the process, replaces it with the pure binary form. It does this by mathematically "expanding" the BCD numeral into a sum of units, as set forth in sections 1 and 2 of this Appendix. At the intermediate stages of the process, the partially converted numeral in the register is a mixture of BCD and pure binary numerals. During the process the successive elimination of the BCD hundreds and ten places occur, and they are combined (by addition), at the end, with the BCD units place (which is the same in BCD and in pure binary)—see section 1, *supra*. As a consequence, the length of the units part of the numeral keeps increasing as other portions of the numeral are added into it. At the end, what was formerly the units digit of the BCD numeral has become the entire pure binary numeral, and has been progressively lengthened to accommodate the quantities added onto it by the mathematical "expansion" process. In this case of *63*, eight BCD digits are

result of this multiplication to the BCD units digit.[13] See the first paragraph of this section (p. 3a, *supra*).

This completes the operation to be performed on the first element of the four-element BCD tens digit.

Step 7—"shifting the signals to the right by at least three positions in preparation for a succeeding binary *1* in the second position of said register"—is a recitation that the procedure requires that *each* element[14] (going from right to left) of the BCD tens digit must be multiplied by 1010, and then added to the BCD units digit.[15]

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replaced by six pure binary digits; for *253*, twelve BCD digits become eight pure binary digits—in both cases, the last four BCD digits are progressively lengthened by the "expansion" procedure until they represent the entire number and are six or eight digits long, respectively.

[13] In applying these steps to the conversion of decimal *53* from its BCD form (0101/0011), as previously indicated, *supra*, note 8, step 2 shifts the four elements of the BCD units digit three places to the right. Step 4 adds a *1* to the fourth element of the BCD units digit (the italicized *0* of 0101/*0*011) and steps 5 and 6 add a *1* to the second element of the units digit (the italicized *1* of 0101/*0*0*1*1; taken together these steps are: *1010+0011*=1101, where the italicization indicates the numerical elements involved in the steps).

[14] For the conversion of decimal *53* from its BCD form (0101/0011), the next relevant element (and the last one that has a *1*) (going from right to left) of the BCD tens digit is the third position (the italicized *1* of 0*1*01/0011). Step 7 shifts the four elements of the BCD units digit (now converted to 1101 after steps 1–6, see n. 12, *supra*), exactly four places to the right. Repeating step 4 adds a *1* to the sixth element of the units portion of the numeral, and repeating steps 5 and 6 adds a *1* to the fourth element of the same portion. (Compare Resp. Br. 11a–13a.)

[15] Presumably, this is to be done by repeating steps 3–6 of Claim 8, although the claim itself fails expressly to state the need for such repetition. Claim 13, however, does expressly state that need.

U.S. GOVERNMENT PRINTING OFFICE: 1972

In The

Supreme Court of the United States

October Term 1972

No. 71-485.

ROBERT GOTTSCHALK, ACTING COMMISSIONER OF PATENTS,

Petitioner,

v.

GARY R. BENSON AND ARTHUR C. TABBOT,

Respondents.

ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS.

MOTION OF COMPUTER SOFTWARE ANALYSTS, INC. AND COMPUTERIZED LISTS CORP. FOR LEAVE TO FILE BRIEF AMICI CURIAE

Computer Software Analysts, Inc. and Computerized Lists Corp. respectfully move for leave to file the attached brief *amici curiae* in the above-identified case. Petitioner and respondent have both consented to the filing of this brief. The letters of consent have been filed with the Clerk of the Court.

Applicants submit that the attached brief *amici curiae* will be of assistance to the Court. *Amici* are both small software companies operating in Los Angeles, California. They were formed and are principally owned and operated by software specialists of minority ethnic groups. Briefs of respondents and the briefs *amici curiae* heretofore filed in support of respondent's position have dealt to a degree with the small businessman's view. The present *amici* believe their position unique in that they portray to the court the real-life position of the small businessmen of the black community attempting to compete with giants who vend hardware as well as software and services. This brief presents the view of a small businessman in the computer software field and his need for an effective mode of protection for any of his proprietary intellectual creations which rise to the level of invention.

Accordingly, Computer Software Analysts, Inc. and Computerized Lists Corp. respectfully request that this court grant leave to file the attached brief *amici curiae*.

Respectfully submitted,

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ROBERT GOTTSCHALK, ACTING COMMISSIONER OF PATENTS,
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ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS.

BRIEF AMICI CURIAE FOR COMPUTER SOFTWARE ANALYSTS, INC. AND COMPUTERIZED LISTS CORP.

Computer Software Analysts, Inc. and Computerized Lists Corp. respectfully submit this brief with the consent of both parties. The letters of consent have been filed with the Clerk of this Court.

I.

QUESTION PRESENTED

Whether the Court of Customs and Patent Appeals erred in finding the method of operation of a general purpose computer as set forth by claims 8 and 13 comprises subject matter which may be patented under 35 U. S. C. §§ 100 and 101.

II.

INTERESTS OF AMICI CURIAE

Computer Software Analysts, Inc. and Computerized Lists Corp. engage in the computer field, marketing various computer services and proprietary software products.

Computer Software Analysts, Inc. was incorporated December 1969 with capital of less than $2,000. It had three employees at that time. It now has twenty-six employees. It had sales of about $70,000 in 1970, $150,000 in 1971, and over $500,000 for the year 1972. Mr. Levi J. Carey, president and principal stockholder, is a black businessman. About one-third of the employees are black. Mr. Carey owns the majority stock interest in the company. The rest of the stock is owned by employees. Two of the three Directors of the company are black.

The company business lies in three main areas:

1. Software validation and testing wherein a software tool called QUALIFIER is employed to improve quality of existing software. Their software is made available to customers under a secrecy agreement which restricts availability of the program listing.

2. Systems analysis tasks are undertaken wherein computerized modeling and testing is involved. The company develops and uses proprietary programs to make evaluations.

3. Software development and management under a software program entitled SPLIT, a meta-complier which simplifies the development of software tools and makes existing software usable on different machines without requiring that the program be completely rewritten.

Computerized Lists Corp. was formed in mid-1972 to service commercial non-government activities involving software for computerized mail lists and the like. Two-thirds of the Board of Directors are minority, one black and one oriental. There are at present three employees. It started with a capital of about $2,000. Their products are unique programs for file maintenance and creative accounting.

III.

NEED FOR PATENT PROTECTION

The software industry is of special interest to those of minority races primarily because relatively low capital is required to enter the market. Investment in plants, production machinery, warehouses, and extensive personnel characteristic of many other industries is not required. Intellectual capabilities and know-how as to software and programs are the needed credentials. The only basic machinery requirement can be satisfied by rental of time which is generally available on a computer and computer related equipment.

Entry into the market requires primarily intellectual capability and know-how possessed by software analysts and programmers together with access to data processing machinery.

Staying power, once a software business is launched, may be greatly enhanced by the availability of patent protection on innovations which rise to the stature of invention. In the data processing setting, patents are deemed far more important to the small entrepreneur than to the giant. Patents may make the difference between failure and success to the struggling small unit.

Protection is especially important where the property is characterized by ease of duplication in immediately usable form, as is the case with software.

Absent patent protection, the only other means offering hope of any protection are adoption of (1) copyright measures or (2) secrecy agreements. Secrecy is contrary to the constitutional purpose upon which the patent system is based. *Amici* do not espouse copyright as effective. They see and feel the need for more adequate protection than either copyright or secrecy.

Patent protection for software is, therefore, considered to be of great importance in providing the incentive and shield necessary for small businessmen, whether of minority ethnic groups or otherwise, to successfully compete in the software industry.

IV.

CONCLUSION

Consistent with constitutional purposes to promote such useful arts as *amici* employ, the decision below should be affirmed in all respects.

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NOTICE: This opinion is subject to formal revision before publication in the preliminary print of the United States Reports. Readers are requested to notify the Reporter of Decisions, Supreme Court of the United States, Washington, D.C. 20543, of any typographical or other formal errors, in order that corrections may be made before the preliminary print goes to press.

SUPREME COURT OF THE UNITED STATES

No. 71-485

Robert Gottschalk, Acting Commissioner of Patents, Petitioner, *v.* Gary R. Benson and Arthur C. Tabbot.

On Writ of Certiorari to the United States Court of Customs and Patent Appeals.

[November 20, 1972]

MR. JUSTICE DOUGLAS delivered the opinion of the Court.

Respondents filed in the Patent Office an application for an invention which was described as being related "to the processing of data by program and more particularly to the programmed conversion of numerical information" in general purpose digital computers. They claimed a method for converting binary-coded-decimal (BCD) numerals into pure binary numerals. The claims were not limited to any particular art or technology, to any particular apparatus or machinery, or to any particular end use. They purported to cover any use of the claimed method in a general purpose digital computer of any type. Claims 8 and 13 [1] were rejected by the Patent Office but sustained by the Court of Customs and Patent Appeals, 441 F. 2d 682. The case is here on a petition for a writ of certiorari. 405 U. S. 915.

The question is whether the method described and claimed is a "process" within the meaning of the Patent Act.[2]

[1] They are set forth in the Appendix to this opinion.

[2] 35 U. S. C. § 100 (b) provides:

"The term 'process' means process, art or method, and includes a

A digital computer, as distinguished from an analogue computer, is that which operates on data expressed in digits, solving a problem by doing arithmetic as a person would do it by head and hand.[3] Some of the digits are stored as components of the computer. Others are introduced into the computer in a form which it is designed to recognize. The computer operates then upon both new and previously stored data. The general purpose computer is designed to perform operations under many different programs.

The representation of numbers may be in the form of a time-series of electrical pulses, magnetized spots on the surface of tapes, drums, or discs, charged spots on cathode ray tube screens, or the presence or absence of punched holes on paper cards, or other devices. The method or program is a sequence of coded instructions for a digital computer.

The patent sought is on a method of programming a general purpose digital computer to convert signals from binary coded decimal form into pure binary form. A procedure for solving a given type of mathematical problem is known as an "algorithm." The procedures set forth in the present claims are of that kind; that is to say, they are a generalized formulation for programs to solve mathematical problems of converting one form of numerical representation to another. From the generic formulation, programs may be developed as specific applications.

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new use of a known process, machine, manufacture, composition of matter, or material."

35 U. S. C. § 101 provides:

"Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title."

[3] See Benray, Understanding Digital Computers (1946) p. 4.

The decimal system uses as digits the 10 symbols 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9. The value represented by any digit depends, as it does in any positional system of notation, both on its individual value and on its relative position in the numeral. Decimal numerals are written by placing digits in the appropriate positions or columns of the numerical sequence, *i. e.*, "unit" (10^0), "tens" (10^1), "hundreds" (10^2), "thousands" (10^3), etc. Accordingly, the numeral 1492 signifies $(1\times10^3)+(4\times10^2)+(9\times10^1)+(2\times10^0)$.

The pure binary system of positional notation uses two symbols as digits—0 and 1, placed in a numerical sequence with values based on consecutively ascending powers of 2. In pure binary notation, what would be the tens position is the two position; what would be hundreds position is the fours position; what would be the thousands position is the eights. Any decimal number from 0 to 10 can be represented in the binary system with four digits or positions as indicated in the following table.

	Shown as the sum of powers of 2									
	2^3		2^2		2^1		2^0			
Decimal	(8)		(4)		(2)		(1)		Pure Binary	
0	= 0	+	0	+	0	+	0	=	0000	
1	= 0	+	0	+	0	+	2^0	=	0001	
2	= 0	+	0	+	2^1	+	0	=	0010	
3	= 0	+	0	+	2^1	+	2^0	=	0011	
4	= 0	+	2^2	+	0	+	0	=	0100	
5	= 0	+	2^2	+	0	+	2^0	=	0101	
6	= 0	+	2^2	+	2^1	+	0	=	0110	
7	= 0	+	2^2	+	2^1	+	2^0	=	0111	
8	= 2^3	+	0	+	0	+	0	=	1000	
9	= 2^3	+	0	+	0	+	2^0	=	1001	
10	= 2^3	+	0	+	2^1	+	0	=	1010	

The BCD system using decimal numerals replaces the character for each component decimal digit in the decimal numeral with the corresponding four-digit binary

numeral, shown in the righthand column of the table. Thus decimal 53 is represented as 0101 0011 in BCD, because decimal 5 is equal to binary 0101 and decimal 3 is equivalent to binary 0011. In pure binary notation, however, decimal 53 equals binary 110101. The conversion of BCD numerals to pure binary numerals can be done mentally through use of the foregoing table. The method sought to be patented varies the ordinary arithmetic steps a human would use by changing the order of the steps, changing the symbolism for writing the multiplier used in some steps, and by taking subtotals after each successive operation. The mathematical procedures can be carried out in existing computers long in use, no new machinery being necessary. And, as noted, they can also be performed without a computer.

The Court stated in *MacKay Co.* v. *Radio Corp.*, 306 U. S. 86, 94, that "While a scientific truth, or the mathematical expression of it, is not a patentable invention, a novel and useful structure created with the aid of knowledge of scientific truth may be." That statement followed the long-standing rule that "An idea of itself is not patentable." *Rubber-Tip Pencil Co.* v. *Howard*, 20 Wall. 498, 507. "A principle, in the abstract, is a fundamental truth; an original cause; a motive; and these cannot be patented, as no one can claim in either of them an exclusive right." *LeRoy* v. *Tatham*, 14 How. 156, 175. Phenomena of nature, though just discovered, mental processes, abstract intellectual concepts are not patentable, as they are the basic tools of scientific and technological work. As we stated in *Funk Bros. Seed Co.* v. *Kalo Co.*, 333 U. S. 127, 130, "He who discovers a hitherto unknown phenomenon of nature has no claim to a monopoly of it which the law recognizes. If there is to be invention from such a discovery, it must come from

the application of the law of nature to a new and useful end." We dealt there with a "product" claim, while the present case deals only with a "process" claim. But we think the same principle applies.

Here the "process" claim is so abstract and sweeping as to cover both known and unknown uses of the BCD to pure-binary conversion. The end use may (1) vary from the operation of a train to verification of drivers' licenses to researching the law books for precedents and (2) be performed through any existing machinery or future-devised machinery or without any apparatus.

In *O'Reilly* v. *Morse*, 15 How. 62, Morse was allowed a patent for a process of using electro-magnetism to produce distinguishable signs for telegraphy. *Id.*, at 111. But the Court denied the eighth claim in which Morse claimed the use of "electro-magnetism, however, developed for marking or printing intelligible characters, signs, or letters, at any distance." The Court in disallowing that claim said, "If this claim can be maintained, it matters not by what process or machinery the result is accomplished. For aught that we now know some future inventor, in the onward march of science, may discover a mode of writing or printing at a distance by means of the electric or galvanic current, without using any part of the process or combination set forth in the plaintiff's specification. His invention may be less complicated—less liable to get out of order—less expensive in construction, and its operation. But yet if it is covered by this patent the inventor could not use it, nor the public have the benefit of it without the permission of this patentee." *Id.*, at 113.

In *The Telephone Cases*, 126 U. S. 1, 534, the Court explained the *Morse* case as follows: "The effect of that decision was, therefore, that the use of magnetism as a motive power, without regard to the particular process

with which it was connected in the patent, could not be claimed, but that its use in that connection could." Bell's invention was the use of electric current to transmit vocal or other sounds. But the claim was not "for the use of a current of electricity in its natural state as it comes from the battery, but for putting a continuous current in a closed circuit into a certain specified condition suited to the transmission of vocal and other sounds, and using it in that condition for that purpose." 126 U. S., at 534. The claim, in other words, was not "one for the use of electricity distinct from the particular process with which it is connected in his patent." *Id.*, at 535. The patent was for that use of electricity "both for the magnetic and variable resistance methods." *Id.*, at 538. Bell's claim in other words, was not one for all telephonic use of electricity.

In *Corning* v. *Burden*, 15 How. 252, 267–268, the Court said "One may discover a new and useful improvement in the process of tanning, dyeing, etc. irrespective of any particular form or mechanical device." The examples given were the "arts of tanning, dyeing, making waterproof cloth, vulcanizing India rubber, smelting ores." *Id.*, at 267. Those are instances, however, where the use of chemical substances or physical acts such as temperature control change articles or materials. The chemical process or the physical acts which transform the raw material are, however, sufficiently definite to confine the patent monopoly within rather definite bounds.

Cochran v. *Deener*, 94 U. S. 780, involved a process for manufacturing flour so as to increase its quality. The process first separated the superfine flour and then removed impurities from the middling by blasts of air, reground the middlings, and then combined the product with the superfine. *Id.*, at 785. The claim was not lim-

ited to any special arrangement of machinery. *Ibid.* The Court said,

> "That a process may be patentable, irrespective of the particular form of the instrumentalities used, cannot be disputed. If one of the steps of a process be that a certain substance is to be reduced to a powder, it may not be at all material what instrument or machinery is used to effect that object, whether a hammer, a pestle and mortar, or a mill. Either may be pointed out; but if the patent is not confined to that particular tool or machine, the use of the others would be an infringement, the general process being the same. A process is a mode of treatment of certain materials to produce a given result. It is an act, or a series of acts, performed upon the subject-matter to be transformed and reduced to a different state or thing." *Id.*, at 787–788.

Transformation and reduction of an article "to a different state or thing" is the clue to the patentability of a process claim that does not include particular machines. So it is that a patent in the process of "manufacturing fat acids and glycerine from fatty bodies by the action of water at a high temperature and pressure" was sustained in *Tilghman* v. *Proctor*, 102 U. S. 707, 721. The Court said, "The chemical principle or scientific fact upon which it is founded is, that the elements of neutral fat require to be severally united with an atomic equivalent of water in order to separate from each other and become free. This chemical was not discovered by Tilghman. He only claims to have invented a particular mode of bringing about the desired chemical union between the fatty elements and water." *Id.*, at 729.

Expanded Metal Co. v. *Bradford*, 214 U. S. 366, sustained a patent on a "process" for expanding metal. A process "involving mechanical operations and producing

a new and useful result," *Id.*, at 385–386, was held to be a patentable process, process patents not being limited to chemical action.

Smith v. *Snow*, 294 U. S. 1, and *Waxham* v. *Smith*, 294 U. S. 20, involved a process for setting eggs in staged incubation and applying mechanically circulated currents of air to the eggs. The Court in sustaining the function performed (the hatching of eggs) and the means or process by which that is done, said:

> "By the use of materials in a particular manner he secured the performance of the function by a means which had never occurred in nature, and had not been anticipated by the prior art; this is a patentable method or process. A method, which may be patented irrespective of the particular form of the mechanism which may be availed of for carrying it into operation, is not to be rejected as 'functional,' merely because the specifications show a machine capable of using it." 294 U. S., at 22.

It is argued that a process patent must either be tied to a particular machine or apparatus or must operate to change articles or materials to a "different state or thing."

We do not hold that no process patent could ever qualify if it did not meet the requirements of our prior precedents. It is said that the decision precludes a patent for any program servicing a computer. We do not so hold. It is said that we have before us a program for a digital computer but extend our holding to programs for analog computers. We have, however, made clear from the start that we deal with a program only for digital computers. It is said we freeze process patents to old technologies, leaving no room for the revelations of the new, onrushing technology. Such is not our purpose. What we come down to in a nutshell is the following.

It is conceded that one may not patent an idea. But in practical effect that would be the result if the formula for converting binary code to pure binary were patented in this case. The mathematical formula involved here has no substantial practical application except in connection with a digital computer, which means that if the judgment below is affirmed, the patent would wholly pre-empt the mathematical formula and in practical effect would be a patent on the algorithm itself.

It may be that the patent laws should be extended to cover these programs, a policy matter to which we are not competent to speak. The President's Commission on the Patent System [4] rejected the proposal that these programs be patentable: [5]

> "Uncertainty now exists as to whether the statute permits a valid patent to be granted on programs. Direct attempts to patent programs have been rejected on the ground of nonstatutory subject matter. Indirect attempts to obtain patents and avoid the rejection, by drafting claims as a process, or a machine or components thereof programmed in a given manner, rather than as a program itself, have confused the issue further and should not be permitted.
>
> "The Patent Office now cannot examine applications for programs because of a lack of a classification technique and the requisite search files. Even if these were available, reliable searches would not be feasible or economic because of the tremendous volume of prior art being generated. Without this search, the patenting of programs would be tantamount to mere registration and the presumption of validity would be all but nonexistent.

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[4] To Promote the Progress of Useful Arts, Report of the President's Commission on the Patent System (1966).

[5] *Id.*, at 13.

"It is noted that the creation of programs has undergone substantial and satisfactory growth in the absence of patent protection and that copyright protection for programs is presently available."

If these programs are to be patentable,[6] considerable problems are raised which only committees of Congress can manage, for broad powers of investigation are needed, including hearings which canvass the wide variety of views which those operating in this field entertain. The technological problems tendered in the many briefs before us[7] indicate to us that considered action by the Congress is needed.

Reversed.

MR. JUSTICE STEWART, MR. JUSTICE BLACKMUN, and MR. JUSTICE POWELL took no part in the consideration or decision of this case.

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[6] See Wild, Computer Program Protection: The Need to Legislate a Solution, 54 Corn. L. Rev. 586, 604–609 (1969); Bender, Computer Programs: Should They Be Patentable, 68 Col. L. Rev. 241 (1968); Buckman, Protection of Proprietory Interest in Computer Programs, 51 J. Pat. Off. Soc'y 135 (1969).

[7] Amicus briefs of 16 interested groups have been filed in this case.

APPENDIX

Claim 8 reads:

"The method of converting signals from binary coded decimal form into binary which comprises the steps of—

"(1) storing the binary coded decimal signals in a reentrant shiftregister,

"(2) shifting the signals to the right by at least three places, until there is a binary '1' in the second position of said register,

"(3) masking out said binary '1' in said second position of said register,

"(4) adding a binary '1' to the first position of said register,

"(5) shifting the signals to the left by two positions,

"(6) adding a '1' to said first position, and

"(7) shifting the signals to the right by at least three positions in preparation for a succeeding binary '1' in the second position of said register."

Claim 13 reads:

"A data processing method for converting binary coded decimal number representations into binary number representations comprising the steps of—

"(1) testing each binary digit position i, beginning with the least significant binary digit position, of the most significant decimal digit representation for a binary '0' or a binary '1';

"(2) if a binary '0' is detected, repeating step (1) for the next least significant binary digit position of said most significant decimal digit representation;

"(3) if a binary '1' is detected, adding a binary '1' at the (i+1)th and (i+3)th least significant binary digit positions of the next lesser significant decimal digit representation, and repeating step (1) for the next least significant binary digit position of said most significant decimal digit representation;

"(4) upon exhausting the binary digit positions of said most significant decimal digit representation, repeating steps (1) through (3) for the next lesser significant decimal digit representation as modified by the previous execution of steps (1) through (3); and

"(5) repeating steps (1) through (4) until the second least significant decimal digit representation has been so processed."